IAVE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

November, 1959

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Not all buyers of drawing instruments can afford the finest. But any man who buys anything less than the very best he CAN afford may well be handicapping himself with the most expensive "bargain" of his entire lifetime. It must be more than mere coincidence that so many successful engineers use and recommend Dietzgen Drawing Instruments.

Dietzgen Drawing Sets are offered in a wide range of sizes and prices to meet every need . . . featured by the better dealers everywhere.

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SEE IT AT YOUR NEAREST DELTA DEALER—he's listed under "TOOLS" in the Yellow Pages—or write: Rockwell Manufacturing Company, Delta Power Tool Division, 402L N. Lexington Avenue, Pittsburgh 8, Pa.

BLADE WELDER, *including shear and grinder, shown on No. 28-462 Bracket mounted on 20" Band Saw for machine-side use. (Optional accessories)*

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IA / VE

Vol. 48, No. 9 / November, 1959

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Associate Editor
Edward J. Pollock

Assistant Editors
Helen Graf, Barbara Collins

Circulation Manager
M. J. Rutz

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Advertising Sales

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the bulletin board / news notes and trends in industrial education

TRADE SCHOOLS WEIGH MACHINE SHOP COURSE

A stepped-up program of instruction in machine shop work was urged upon New York City's vocational high schools in a recent report on a survey conducted by the Advisory Board for Vocational and Extension Education.

Mrs. Betty Hawley Donnelly is the board's executive secretary.

The survey proved that a machine shop is no place for a student with less than average intelligence or ninth-year reading level. Other requirements listed call for mechanical aptitude, good vision for close work, normal color discrimination, aptitude in math, good physical health, and proper attitudes toward work, including punctuality and conscientiousness.

The report recommends that academic studies be emphasized along with basic machine shop skills, leaving specialization to on-the-job training offered by industry for new employees.

NEW ASSOCIATION FORMED

A new organization called The Academy of Teachers of Occupations is now being formed by a group of college professors and high school counselors. Its purpose is "to promote and improve the teaching of occupations in schools, colleges, and universities."

The teaching of occupations is defined as "the classroom teaching of an academic course, the primary purpose of which is to provide students with information regarding opportunities and requirements for employment in a variety of occupations."

Applications for admission may be obtained from *Professor Robert Hoppock, New York University, New York 3, N. Y.*

KODAK HIGH SCHOOL PHOTO CONTEST

Eastman Kodak Company announces that the Kodak High School Photo Contest for 1960 will add a new color division and increase the awards. Celebrating its 15th anniversary, the contest will offer 338 prizes totaling $11,750 in cash awards.

Entries may be submitted anytime between January 1 and March 31, 1960, inclusive. Pictures must have been taken since April 1, 1959.

For further information, contact *Miss E. M. Brearley, Supervisor, Kodak High School Photo contest, Rochester 4, N. Y.*

I-A WORKSHOP AT STOUT

Stout State College, Menomonie, Wis., acted as host to over 100 educators from a number of midwestern states on Friday, October 16, for an all-day industrial-arts workshop held on the campus.

Five specialists in varied fields of industrial education addressed the conference.

Speakers and their topics included: Norman Geiger of the Falk Corporation, Milwaukee — "Modern Drafting Room Procedures"; O. J. Seeds, Alloy Department of Cerro De Pasco Sales Corporation, New York — "The Newest Applications of the Low Melting Point Metals in Industrial Arts Classes"; Guy Long, Chippewa Falls, Wis., public schools — "Gem Cutting and Polishing"; William Smale, Evinrude Motors, Milwaukee — "Modern Two Cycle Engines"; and Dr. E. Robert Rudiger, professor of industrial education, Stout State College — "The Implications of the Conant Report to Industrial Education."

NATIONAL SAFETY COUNCIL BOOKLET

The National Safety Council has prepared a booklet intended to help the millions of professional drivers who must constantly make decisions behind the wheel.

A single sample copy of "A Professional Code for Defensive Driving," a colorful, 20-page publication, is available upon request from the *National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.*

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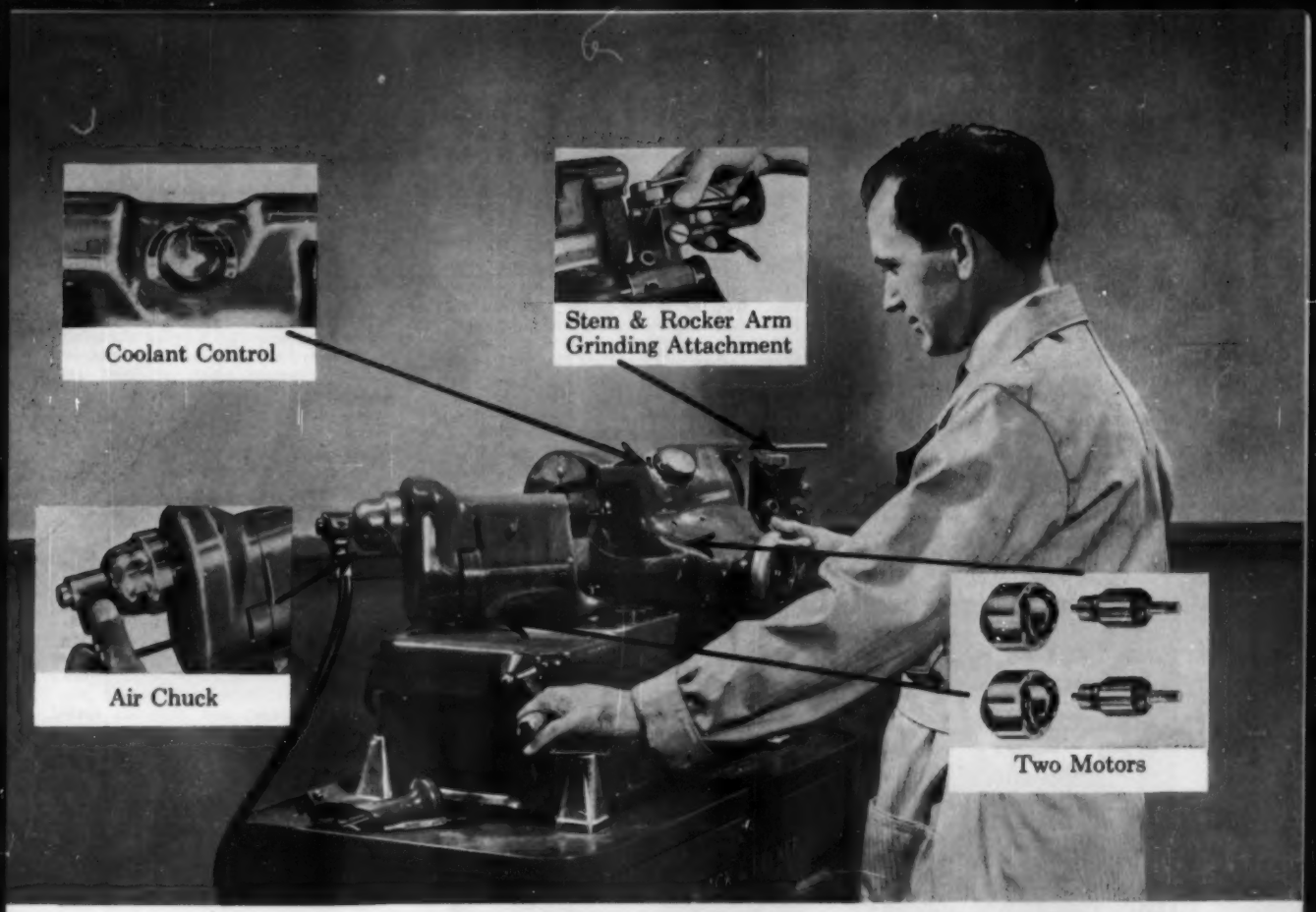

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Many instructors are taking a second look at their valve refacers and finding them out-of-date. Graduates complain they've been trained on old-fashioned machines.

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If your present refacer doesn't have these features it's earned retirement! Call your local distributor for a free demonstration. Remember, you owe it to your students to train them on the tools *in use* in the field. For additional information write: THE BLACK & DECKER MFG. CO., Dept. 4511, Towson 4, Md. (In Canada: Brockville, Ontario.)

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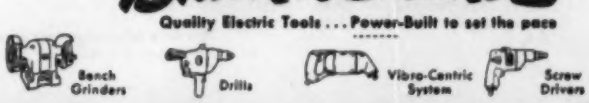

association / news

VISUAL COMMUNICATIONS CONGRESS

The Third Annual International Visual Communications Congress, sponsored by the Society of Reproduction Engineers, is to be held in the Statler Hilton Hotel in New York City, Thursday, Friday, and Saturday, December 3, 4, and 5, 1959.

Everett Kaestner, Bell Telephone Laboratories, New York City, is the general chairman of the 1959 Congress.

Technical sessions will be held each morning at which speakers from in-plant graphic reproductions-visual communications departments and manufacturers of materials and services will discuss the latest available techniques in the field of electrostatic printing, micro-reproduction and retrievables, office copying machines, offset, diazo, and other methods of reproduction.

17TH ANNUAL FOUR-STATE CONFERENCE

"Guidance Functions and Relationships in Industrial Arts and Vocational Education," was the theme of the 17th Annual Four-State Conference on Industrial Arts and Vocational Education, held at Kansas State College of Pittsburg on October 9 and 10, 1959. The Conference was well attended by industrial arts and vocational education personnel from Arkansas, Missouri, Oklahoma, and Kansas.

Featured general session speakers at this year's conference included Herbert True, vice-president, Institute for Visual Research, South Bend, Ind., speaking on "Creative Teaching — Our Last Frontier," and "The Care and Feeding of Ideas."

C. R. Crakes, educational consultant, DeVry Technical Institute, Chicago, Ill., spoke on the subject "Guidance for the Electronic Age."

In addition to the general sessions the two-day conference included sectional meetings which provided an opportunity for the individual to pursue his special interests.

Between sessions conferees visited the exhibits of equipment and supplies displayed by more than forty exhibitors who sponsor the Ship's Program which concludes the conference. — *Thaine D. McCormick.*

APIC MEETS

The American Production and Inventory Control Society held its second annual National Technical Conference and Exhibit on October 16 and 17, 1959, at the Hotel New Yorker, New York City.

Production control managers and supervisors heard discussions of the latest developments and problem-solving techniques in the field such as the fluctuating usage of inventory control, effect of engineering changes, job shop production control, scheduling and dispatching, use of punched cards, data processing equipment and applied statistics, sales and production forecasting, and materials management.

National headquarters: *330 South Wells St., Chicago, Ill.*

AMERICAN WELDING SOCIETY

The American Welding Society announces their 41st Annual Meeting and Welding Exposition at Los Angeles on April 25 to 29, 1960.

American Welding Society, 33 West 39th St., New York 18, N. Y.

NATIONAL AUDIO-VISUAL ASSOCIATION

The 19th Annual National Audio-Visual Convention and Exhibit, sponsored by the National Audio-Visual Association, was held July 25 to 28, 1959, in Chicago at the Morrison Hotel.

The general convention chairman was W. G. Kirtley, Louisville, Ky.

COMING CONVENTIONS

Nov. 5. Missouri Vocational Association, at Auditorium, St. Louis, Mo. Secretary, M. Cecil V. Roderick, 122 Waters, Columbia, Mo.

Nov. 5–6. Iowa Industrial Education Association, at Des Moines, Iowa. Secretary-Treasurer, Leonard Bengtson, Central Junior High School, Ames, Iowa.

Nov. 6–7. Kentucky Industrial Education Association, at Kentucky Hotel, Louisville, Ky. Pirate, Paul E. Harris, 506 West Hill St., Louisville, Ky.

Nov. 6–7. New England Industrial Arts Teachers Association, at Hotel Taft, New Haven, Conn. Secretary, Edward P. Stach, Warren Harding High School, 1734 Central Ave., Bridgeport 10, Conn.

Nov. 12–14. Mississippi Valley Industrial Arts Conference, at LaSalle Hotel, Chicago, Ill. Chairman, Dr. Verne C. Fryklund, Stout State College, Menomonie, Wis.

Dec. 6–9. American Technical Education Association, at Conrad Hilton Hotel, Chicago, Ill. Secretary, William N. Fenninger, 22 Oakwood Place, Delmar, N. Y.

Dec. 7–11. American Vocational Association, at Conrad Hilton Hotel, Chicago, Ill. Pirate, Lowell A. Burkett, 1010 Vermont Ave., N.W., Washington, D. C.

new safety feature!

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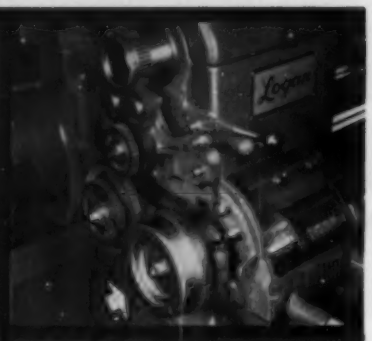

12" Lathe

All Logan 11", 12" and 14" lathes, as well as models 1825 and 1875 *(shown)* 10" lathes, now offer positive overload protection without additional cost. Exclusive Automatic Safety Gear absorbs shock of sudden overloads when threading, preventing gear damage from spindle to gear box. Also protects all gears in gear box up to 52 threads per inch. The combination of this Safety Gear and spring-loaded lever-operated clutch in apron gives the same protection for corresponding feeds. Can be factory-installed on other models of new 10" and 9" quick-change lathes. Available for present Logan quick-change lathes: $10 for 9", 10" and 11" sizes, $15 for 12" and 14".

10" Lathe

For full model details and evidence of Logan's low upkeep and better service, see your Logan dealer, or write for catalog.

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These professional quality tool chests are designed and built to Starrett toolmaker specifications — in ruggedly finished, rigidly reinforced steel or hand-rubbed Honduras mahogany. Available now through Starrett distributors without tools or with three different assortments of Starrett Tools selected to provide basic, intermediate or advanced precision measuring equipment for students and apprentices of all grades as well as working machinists and tool and die makers.

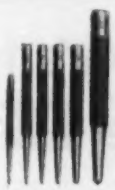
Metal Chest No. 200MC Size 20 x 8½ x 13¾ with top compartment and seven drawers felt lined. Front panel locks with top, slides under bottom drawer when open. Complete with 21 tools.

Wood Chest No. 200WC Size 20 x 9½ x 13 with top compartment and nine drawers felt lined. Front panel locks with top or slides under bottom drawer. Complete with 21 tools.

No. 11 Combination Square with Center Head has easy-to-clean black wrinkle finish. Available in 4, 6, 9, 12-inch and larger sizes.

6, 12, 18 and 24-inch steel rules with Satin Chrome Finish (pioneered by Starrett). Flexible or spring tempered types, fractional or decimal graduations.

No. 56 Surface Gage for use on round work or flat surfaces has 2½" base, 4" or 7" spindle, gage pins in base, fine adjusting screw.



No. 117 Center Punches are hardened on both ends for safety and long life. Made with round shank, knurled grip, accurately centered tips.

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New Bulletin 1203, "How to Read, Use, Care for Micrometers and Vernier Gages."

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To develop and recognize fine craftsmanship among students, Ford Motor Company is now sponsoring its fourteenth annual Industrial Arts Awards Program.

While it might seem somewhat early to start encouraging your students to participate in the 1960 Ford IAA Program, past experience shows that most award-winning entries are planned and completed well in advance of deadline pressure.

As in past years, any high-quality industrial arts or vocational project made by students in the 7th through 12th grades may be submitted. There will be cash prizes . . . trophies presented to the schools of the first-place winners . . . plus an all-expense-paid trip to Detroit for the 32 Outstanding Achievement Award winners and their teachers. The popular IAA Student Craftsman's Fairs, exhibiting local entries, will also play an important part in the 1960 program.

Remember, the sooner your students begin, the better will be their chances of winning. Why not mail the attached coupon right now while you're thinking about it? We'll send you all the information you need, including a rules booklet, so that you can start your students on their projects right away.

FORD INDUSTRIAL ARTS AWARDS, Dept. B

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I would like to have the official IAA rules booklet and entry blanks. Please send to:

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"Finest saw in its class . . ."

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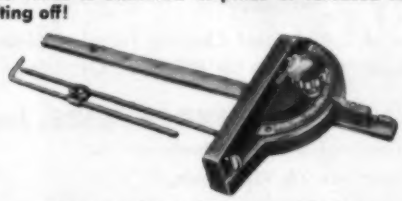
Thick, heavily ribbed grey-iron. Trunnions, cast integrally with 1" thick x 16½" long support members, absorb heaviest cutting loads.

DOUBLE-LOCKING LIFT-OFF FENCE
An exclusive Atlas feature. Slides smoothly, easily. Rigid . . . extends full depth of table . . . locks at both ends . . . one movement of lever and fence is anchored in place or released for lifting off!



MITRE GAUGE KEYED TO TABLE
Gauge can't accidentally fall from front of table, yet can be lifted from center or rear of table.

For ease of operation, safety, and accuracy the Atlas 10" Floor Saw is in a class by itself. It's *ruggedly built* with 3 HP construction throughout. Has totally enclosed 1 to 3 HP continuous duty motors . . . cast iron base . . . modified wedge cog belt drive . . . big, self-cleaning worm and rack mechanisms.

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DI-ACRO SPARTAN MODEL 24

BOX and PAN BRAKE

THE SAFEST INVESTMENT FOR YOUR SCHOOL TOOL FUNDS

Built to rugged industrial standards and boy-proofed, too, the Di-Acro Spartan Box and Pan Brake with all steel base is a quality investment—it will last longer in your shop. It operates more smoothly and performs a greater number of operations than other brakes. Spartan Model 24 Brakes form 16 gauge steel up to 24" wide with a forming bend of 135°. Deep box fingers form boxes up to 3" in depth. The 5-inch-deep forming bar is rigid and makes forming accurate across its full width.

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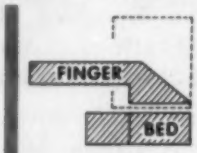

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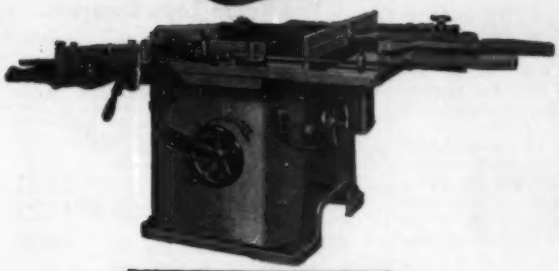

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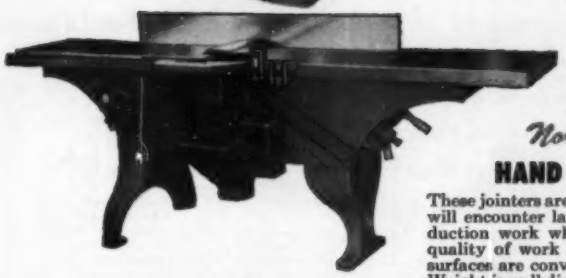

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These jointers are of the type the student will encounter later being used for production work where accuracy and fine quality of work are essential. Working surfaces are convenient to the operator. Weight is well distributed to make a well balanced smooth operating machine. The medium duty machine at right is available in eight and twelve inch widths. Tables are 6'2" long; rabbet depth ⅝". Heavy duty jointers are available in 12" and 16" sizes. Tables are 8' long; rabbet depth ⅝". They use a round three or four knife, safety type cylinder head, and a three horsepower, 3600 R.P.M. T.E.F.C. motor; five H.P. motors and belt drive machines also available.

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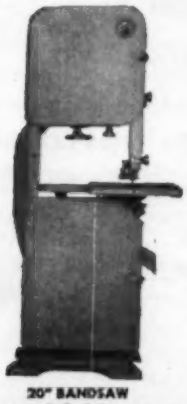

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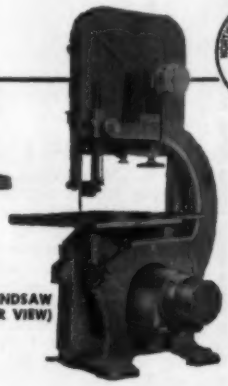
are available in 20", 27", 32" and 36" sizes. The 20" band saw takes 24" x 36" in floor space, horizontal capacity is 20", vertical capacity under guide is 11".

SHAPER



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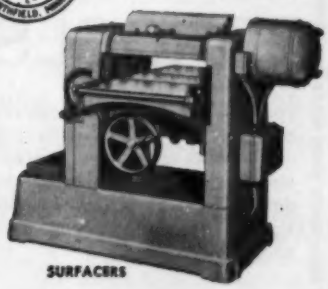

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CONSTRUCTING A WORKBENCH

● Q.: Please give me information and tell me where I may find plans for constructing a workbench. — *M. C.*

A.: Articles published during the years in IA/VE concerning the building of workbenches include:*

Combination Wood and Metal Bench — March, 1934, page 134
Workbench for Home or School Use — October, 1938, page 353
Workbench — November, 1940, page 385
Student Built Workbenches — April, 1951, page 158 — H. G.

INFORMATION ON SHOP LAYOUTS

● Q.: I am a student at ——, enrolled in the industrial arts curriculum. I have received information that you are interested in helping future teachers who are studying in this field. I would appreciate any information about shop layouts which you would send me. — *G. R. L.*

A.: In past issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION we have published many shop layouts. We are giving you a list of the articles on shop planning which have appeared in the pages of the *School Shop Annual*, during the past few years.

1959 — March

Planning School Shops for Tommorrow, p. 59
Cleveland's New Max S. Hayes Trade School, p. 64
Industrial Arts Department — Mt. Pleasant Senior High School, p. 74
New Junior High Industrial Arts Shops, p. 75
New Hobart Brothers Technical School, p. 78
Lake Orion Community Schools, p. 81
Waltham's Vocational High School, p. 83
Industrial Arts Offers Many Courses, p. 86
Shop Organization Simplified, p. 97

1958 — March

W. Tresper Clarke Junior-Senior High School, p. 59
New Facilities for Industrial Education, p. 65
The Spokane Technical and Vocational School, p. 69
Physical Features of the Shops, p. 75
Tool Storage in the Woodshop, p. 102
Oklahoma City Northwest Classen Shops, p. 107 — *E. J. P.*

OLD CATALOG

● Q.: Many years ago I recall seeing a catalog with a title something like "Hard to Get Materials." Since I am unable to find this catalog and have been unable to find out who published it, I am wondering whether you could help me get a copy if one is still available. — *U. K.*

A.: The material contained in the above catalog can be obtained, most likely, by referring to the 1959 Broadhead Garrett Co. (4560 E. 71 St., Cleveland 5, Ohio) catalog. — *C. S.*

*EDITOR'S NOTE: We are not in a position to furnish the pages of these issues, nor the complete copies in most cases. We would recommend looking at this material at your public library, the high school library, the libraries of the supervisor of industrial arts or of vocational education, or teachers of these subjects who keep or bind their back copies of our magazine.

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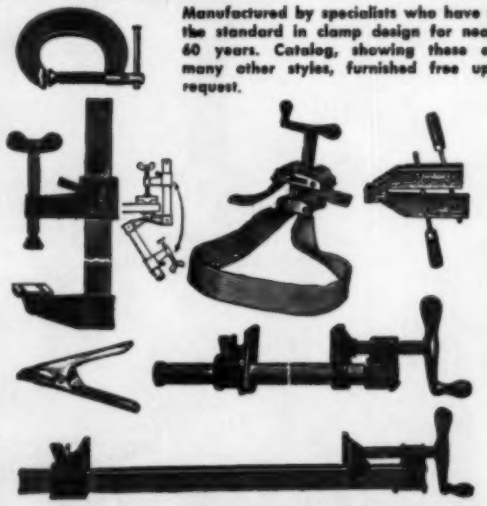

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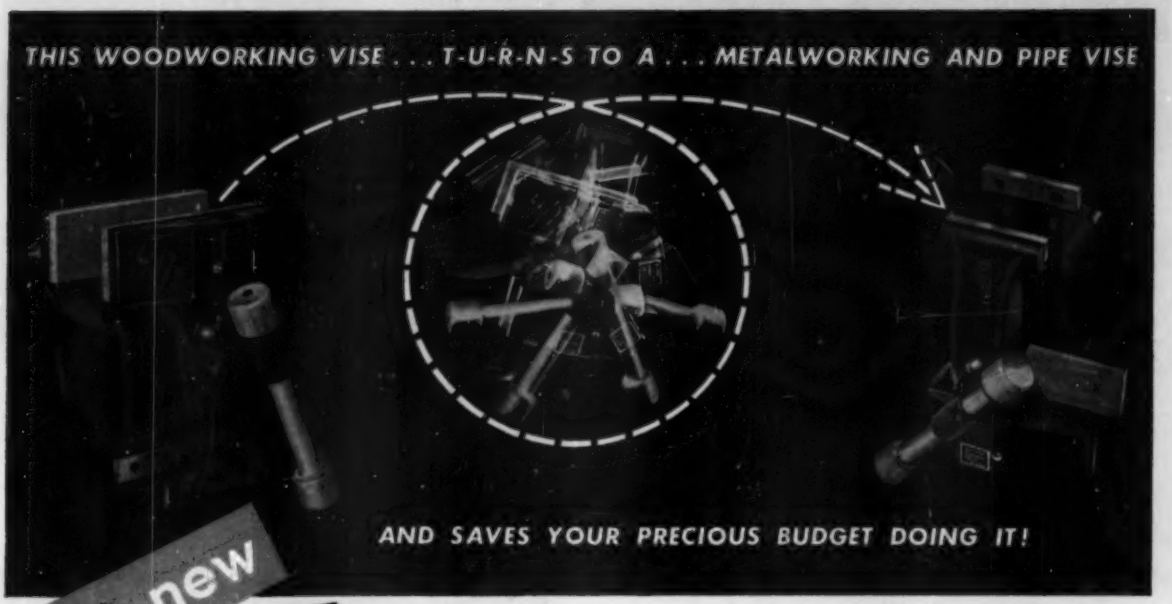

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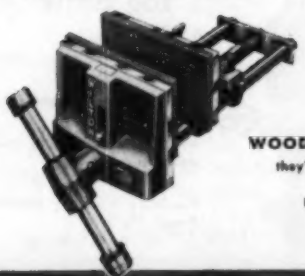

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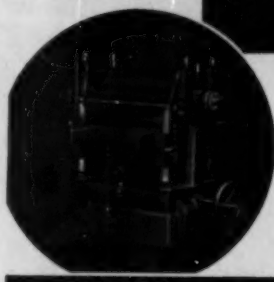

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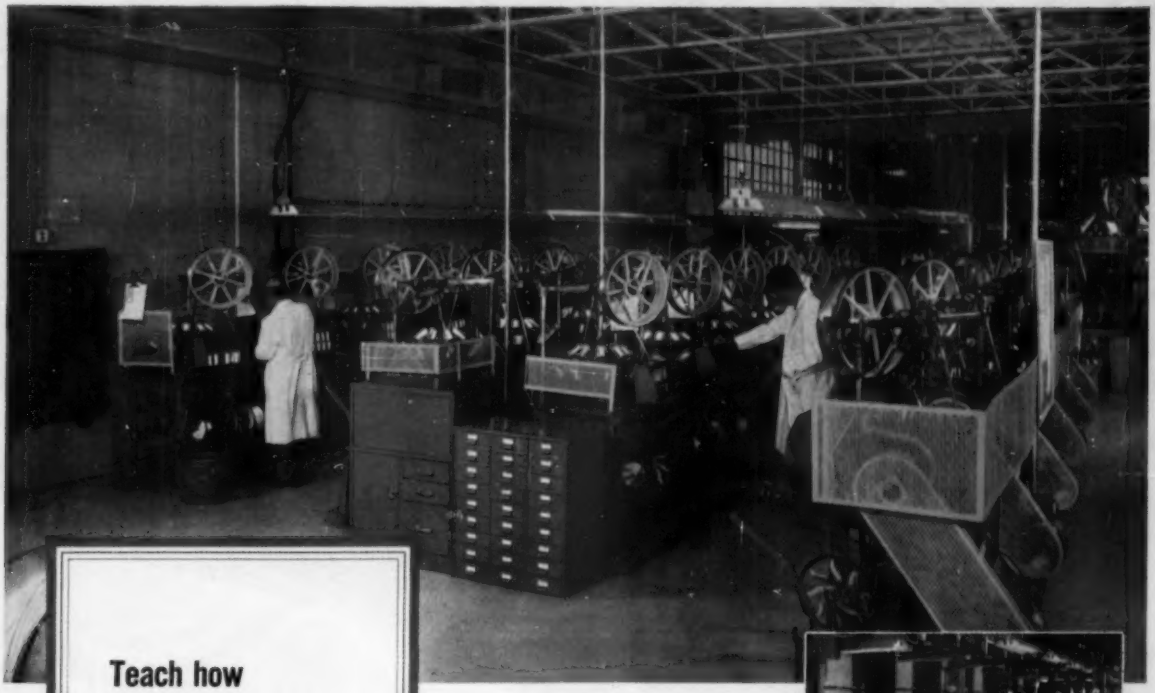

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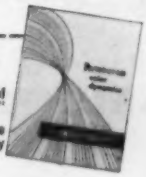

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DOES OUR TAKE-HOME PAY REALLY *PAY?*

The battle for student time is becoming more intense each year. So many new subjects and activities have been added to the school curriculum that there just aren't enough hours in the day for them all. Some recent additions such as baton twirling, social dancing, and fly tying are condemned (and perhaps rightly so) as the frills of education that should be eliminated. We're being told by traditionalists that we must get back to the basics of "reading, writing, and 'rithmetic," and, due to this demand, it is not uncommon to find some junior high schools omitting even such areas as industrial arts and home economics.

If we are to be truly honest with ourselves, we have to admit that many parents today do not hold industrial arts in very high esteem. When it comes to a showdown as to what should be eliminated from Johnny's program, it will certainly not be the courses in English, mathematics, or science. In all probability, mother and dad would suggest that shop be dropped. Furthermore, they would feel that this change threatens their child with no ill effects.

We teachers in Industrial arts are in great disagreement with the parents who hold this attitude. Not only do we feel that Johnny *will* suffer ill effects, but also we are firmly convinced that a good program in shop contributes as much or more to Johnny's growth as any other part of the school program. In a good industrial arts course he learns to work with the four main ingredients of life: ideas, things, people, and himself.

Now a big question arises. If we are so convinced of the values of our program, why do we make such a poor impression on most parents? As we see it, there are many reasons for this. It seems to us that a major reason — especially at the junior high school level — can be found in the *things Johnny takes home*. Unfortunately, the payoff is, and always has been, the *project*.

Imagine yourself as the parent when Johnny comes bubbling home from eighth grade with books and other school supplies. As he unloads his things on the kitchen table, you see that he brought home his general science book because he had an assignment. You see a beautifully printed book, well illustrated and authoritative. Johnny also deposits his shop project. Let's suppose that it is a funnel that he has spent three weeks completing. Johnny is an average student. His bending, fitting, forming, and soldering make his funnel poor in contrast to the one his Dad bought last week for a quarter. Here is the comparison. On the one hand is an assignment in an attractive modern textbook. You feel confident that Johnny has a topnotch teacher, and that the program is excellent. On the other hand you have the visual evidence of work done in shop. You cannot help feeling that Johnny must be wasting his time in shop. At this point, parents will wonder about the expense involved in equipping a shop and the good salary paid to the teacher. It is not surprising that parents give more and more of their support to general science and mathematics and less to industrial arts.

We recently heard a superintendent suggest that students not be allowed to take home any projects from junior high school shop programs. While this suggestion may be drastic, perhaps it has some merit. However, if Johnny *does* take home a project, the least we industrial arts teachers can do is to make sure he also takes home the textbook and other learning materials. The present-day industrial arts textbook makes a good impression on parents and goes a long way toward explaining our program. An assignment now and then in industrial arts classes will help to educate parents to what we are trying to accomplish. Our program will take on much more significance with parents and others who are paying for our activities.

We have always said that it's not what the boy does to the project but what the project does to the boy that really counts, but how will parents find out what the boy is learning if all they see is the project? It's easy for us to complain that parents and administrators don't understand the real objectives of industrial arts. It's time for us to wake up and face facts. Much of the fault lies in our own lack of good day-to-day public relations. Parents should be given the chance to see industrial arts in the same light as they see the academic subjects. Naturally we don't want shop to become a book course. We would destroy industrial arts if we failed to keep it an activity course. But there are a lot more things involved in "activity" than just "making the chips fly." Real learning takes place only when the student studies about the material, how to use tools and machines, how to plan projects, and about the industry represented by each shop activity. About the only way the average parent can find out about shop is by seeing what Johnny carries home at the end of the school day. We'd better see to it that mom and dad believe Johnny is learning. If we don't, industrial arts may really be labeled a frill of education that ought to be eliminated.

John L. Feirer

A Modern Teacher Training Program

W. A. WOCKENFUSS

- **Industrial-arts education, embedded in the horse-and-buggy stage of our culture, still teaches avocational craft skills, contends the author.**
- **What we need is i-a subject matter and procedures compatible with our 1959 technological society.**
- **Here is a review of an i-a teacher education program aimed at closing the gap between life and what is taught in our institutions modeled after implications of The Minnesota Plan.**

Industrial-arts education is still teaching in the horse-and-buggy stage of our culture. The craftsmanship of the carpenter, cabinet maker, art-metal craftsman, hand typographer, etc., occupies most of the attention of teachers and students in industrial arts laboratories. Such training in a highly technical-industrialized society like ours can serve but two purposes: (1) historical aspect of our culture or (2) development of skills for avocational pursuits.

Curriculum is derived from society. Dr. Florence Stratemeyer, the well-known curriculum expert at Columbia's Teachers College, describes the derivation quite succinctly:

> The kind of society from which learners come points to values they must live by as they share with others the task of building their country and the world. A study of society can indicate the understandings and competencies children and youth are likely to need just as it can bring into focus the problems with which they are dealing and with which they will have to cope. An examination of society also suggests the environments out of which come the citizens who mold the world of today and tomorrow. Cultural values, societal needs, and learner's backgrounds serve as guides to curriculum development.[1]

Havighurst and Neugarten point up the necessity of drawing upon the "science of sociology and social anthropology for material that would help the teacher to understand how the individual becomes a cooperating member of a complex society."[2]

Surely persons like Richards who was instrumental in the adoption of the name of industrial arts and Bonser who gave us the definition of industrial arts which has been virtually unchanged since 1923 made analyses of the society in which they lived. The third yearbook of the American Council on Industrial Arts Teacher Education indicates the ideas and concerns of leaders in the field.

The yearbook shows that some of the leaders have advocated in their teachings and limited publications a continuous study of society to derive subject content for industrial arts subjects. The strong arm of tradition caused some of the analyses of these leaders to become justifications for doing essentially the same type of antiquated teaching of craft skills in some cases. In other cases, tradition in the schools, apathy of many teachers and administrators, and fear due to a feeling of inadequacy on the part of a huge number of industrial arts teachers caused these men to be "voices in the wilderness."

Perhaps because of the current national, technological scare, it seems that the study under the direction of William Micheels at the University of Minnesota will be viewed somewhat more sympathetically than any other attempt to bring industrial arts into a more compatible relationship with our modern society has been viewed. *The Minnesota Plan*[3] (in published form), does not give a very thorough analysis of our society, but it does list many assumptions related to our culture which gives evidence of such an analysis having been done by the committee. Without a more extensive presentation some of the assumptions may seem vague and perhaps ill-founded. The plan wanted, however, to present an outline along which to develop and not to present an extensive treatise at this time.

Nature of the Proposed Program

The Minnesota Plan through its analysis of society derived three cores of instruction for industrial arts: technology, design, and science-mathematics. (Recognizing mathematics as a science, this paper will refer to the latter core as the scientific core.) The proposed program is an illustration of a 1959 industrial arts program which uses the three cores of instruction to educate future teachers in the field.

[1]Stratemeyer, Florence (*et al.*), *Developing A Curriculum for Modern Living* (New York: Bureau of Publications, Teachers College Columbia, 1957), (740 pp.), p. 1.

[2]Havighurst, Robert, and Bernice L. Neugarten, *Society and Education* (Boston: Allyn and Bacon, Inc., 1957) (465 pp.), p. iii.

[3]Micheels, William, and Wesley Sommers, *The Minnesota Plan* (Bloomington: McKnight and McKnight Publishing Co., 1958).

Dr. Wockenfuss is with the University of Maryland at College Park.

TABLE 1. Required Courses for All Students With the Appropriate Substitutions for Industrial Arts Majors (88 Credits)

Professional Orientation	2		
English Composition & Language	3	English Composition & Language	3
History of Western Civilization	3	History of Western Civilization	3
Modern Language	3	Modern Language	3
General Biology	3	General Chemistry	3
Survey of Mathematics	3	Survey of Mathematics	3
Physical Education	½	Physical Education	½
General Psychology	3	Human Growth & Development	3
Western Literature	3	Western Literature	3
Principles of Geography	2	Principles of Economics	3
Personal & Community Health	2	Fundamentals of Speaking	2
Physical Education	½	Physical Education	½
Philosophy of Education	3	Education Psychology	4
Visual Arts in Society	3	Development Reading	2
U. S. History	3		
Social Problems	3	Responsible Teaching	12
		Social & Legal Aspects of Ed.	3

Because the author recently became interested in the University of Rhode Island's college of education and, because this school did not have an industrial arts program, the proposed program was developed to function as part of the total program of this college.

A Modern Industrial-Arts Program

The freshman year at the Rhode Island college of education is essentially the same for all students with an occasional departmental deviation. The proposed program would make a deviation; it would have general chemistry substituted for the second semester of general biology. The only other deviation from the general requirements of the college would be the substitution of principles of economics for the second semester of the principles of geography. Table I is a list (with the two noted deviations) of the courses with the appropriate semester credit hours which are recommended for all future teachers at the Rhode Island college of education.

The course work which prepares the student specifically for the industrial arts field consists of courses in technics and courses in mathematics and science. Table II lists the courses that are recommended for each of the three emphases in industrial arts. Although each student will be taking some courses in each of the three cores of instruction, individual differences and desires can be met by a choice of an emphasis in one of the core areas. The semester credit hours for the industrial arts major area and the total required for graduation is shown for each area of major emphasis.

Course Descriptions

The majority of the courses offered by the industrial arts department are combination classroom-laboratory courses and will meet for two three-hour sessions a week. Several of the courses are classroom type courses with no laboratory involved.

Except for the industry study courses, the laboratory work is primarily in the form of individual experimentation. Industrial ideas, processes, products, and tools may be materially analyzed, structurally formulated, tried or experimented with in some other fashion.

A comprehensive exposition of the proposed program would necessitate an exhaustive description of all of the academic activity involved. This paper, however, will very briefly describe just those courses offered by the industrial arts department.

1. *Industrial Organization* (3 1-hour sessions a week). This course is required of all industrial-arts students. It is the first industrial arts course and contains some orientation materials. The course is designed to study the general industrial structure in the United States. The general functional concepts of management, labor, line, staff, and union are studied.

The next three courses are taught in the technology core. Tools, materials, machines, mechanisms, and energy are studied within various technological applications or processes.

2. *Tools, Materials & Processes* (2 3-hour sessions a week). Tools, both hand and machine, are studied in a functional industrial relationship with materials. Tools and processes dealing with ferrous and nonferrous metals, thermosetting and thermoplastic plastics, ceramics, wood and other durable materials are explored. Laboratory experiments supplement the study.

3. *Industrial Energy — Heat Power* (2 3-hour sessions a week). Sources of power through heat are studied in their industrial context. The industrial harnessing of steam, internal combustion, fission, and fusion are explored. The use of heat-power in the fabrication, forming, shearing, and adhering of materials is part of this study of industrial energy. Laboratory experiments supplement the study.

4. *Industrial Energy — Electrical* (2 3-hour sessions a week). Elementary electrical theory and its industrial applications are studied. Emphasis is placed on the use of electronic control mechanisms. Applications of electronic wave theory, such as ultrasonic machining, are studied. Individual experimentation is conducted in the laboratory.

The four courses, which are listed next, are taught in the scientific core. Technological processes and equipment will of course be an integral part of

— Goodyear News Service

A modern i-a teacher training program should be designed "...to develop teachers adequately prepared to lead analytical studies of industry in a constantly changing culture."

these courses. The emphasis in the scientific core is on the scientific phenomena and their numerous applications to industry and on the scientific analyses of industrial materials.

5. *Forces and Industrial Power* (2 3-hour sessions a week). Basic concepts of statics and dynamics are studied with an emphasis on their applications to tools, machines, and processes. A knowledge of sources, transmission, use, and regulation of industrial power is pursued. Laboratory experiments are an integral part of the study.

6. *Materials — Physical Analysis* (2 3-hour sessions a week). Natural and synthetic materials are analyzed for hardness, compressability, tensile strength, specific weights, etc. Particular attention is given to industrial applications relating to the properties studied. Many of the analyses are obtained through laboratory experimentation.

7. *Materials — Electronic Analysis* (2 3-hour sessions a week). Basic concepts of electronic theory applied to materials are studied — including electrometallurgy, electromerism, electromotion, electron affinity, electro-optics, electrostenolysis, electrothermal, analysis, etc. Much of the study is conducted through laboratory experimentation.

8. *Metallurgy and Metallography* (2 3-hour sessions a week). Understandings sought in this course include the chemical composition of various metals and processes involved in obtaining them, microscopic study of the physical structure of metals, etching and study of the grain of metals which have been cast, cold worked, and hot worked. Some time is given to metachromy and prevention of chemical deterioration. Much of the study is done through laboratory experiments.

Description of Design Courses

Graphical expression is imperative to the functioning of a technical society. It is a tool of communication necessary to lessen the length and the ambiguity of verbal abstractions. It is also a tool of problem solving — of graphically analyzing spatial concepts of forces and materials and analyzing the composition of materials. The design courses which are described below help the student understand the concept of graphical expression as a tool of communication and problem solving. Graphical expression is also a creative medium through which industry plans its aesthetically beautiful as well as functional products.

1. *Elements and Principles of Design* (2 2-hour sessions a week). Basic concepts of design such as proportion, mass, line, and color are studied. Sketching, multiview projection — including auxiliary views and revolution, pictorial representation, and shading are also studied.

2. *Technological Drawing Problems* (2 3-hour sessions a week). This course is especially planned for those students who are taking a technology emphasis in industrial arts. The study of basic tool design, design and materials, spatial design problems of industry, charts and graphs, and problems of material flow is made.

3. *Graphical Analysis* (2 3-hour sessions a week). Charts and graphs, descriptive geometry, graphical statics and dynamics, graphical arithmetic, algebra, and calculus are studied with an emphasis on technological application. The formation and use of nomographs is also explored. This course is especially planned for those students who are taking a scientific emphasis in industrial arts.

4. *Machine Problems and Design* (2 3-hour sessions a week). Graphical force problems, gearing, caming, screw mechanisms, pneumatic and hydraulic applications are explored. Machine structures, functionality of machine design, multiplicity of machine parts, and safety are also studied.

5. *Production Problems and Design* (2 3-hour sessions a week). Charts and graphs of productions, production nomography, plant design (including: human, machine, and material spacing), spatial graphical analysis-including flow patterns and machinery, and safety functions are studied. Much attention is given to pictorial drawing with shades and shadows and air brush work.

6. *Architectural and Structural Design* (2 3-hour sessions a week). Materials of construction, stresses and normal loads, spatial distribution, lighting, ventilation, heating are studied in relation to simple home design. Working drawings, specifications, experiments and construction models are required according to individual need and growth. Principles of pictorial drawing and shadowing are also studied.

7. *Graphic Arts Design* (2 3-hour sessions a week). Principles of line, mass, balance, depth, warmth, and color are applied to printing, poster work, and advertising. Shading and air brush techniques are explored. Letter and alphabet design, types of paper and material, and inks and paints are studied.

Description of Miscellaneous Courses

As a culminating and synthesizing aspect of industrial arts study, three courses in industry study are required. Additional industry study may be taken as an elective.

1. *Industry Study* (2 3-hour sessions a week). Each student will be required to obtain 9 credit hours in Industry Study. Industry study will be offered each semester with a subdivision of one of the following: power, transportation, manufacture, communication, or construction.

At least one industry will be studied in detail within the area offering. The structure of the industry, personnel and union relations, tools, processes, products, social implications, and economic status and influences will be studied for the industry.

(Concluded on page 286)

TABLE II. Courses Recommended for Industrial Arts Majors by Areas of Emphasis

Technology Emphasis 45 credits — 133 total credits

Industrial Organization	3	Labor Economics	3
Trigonometry	3	Technical Drawing Problems	3
Elements & Principles of Design	2	Industrial Energy Electrical	3
Physics I	3	Industrial Arts Practicum	4
Analytical Geometry	3	Industry Study I	3
Physics II	3	Industry Study II	3
Tools, Materials & Processes	3	Industry Study — Individual	3
Industrial Energy — Heat Power	3		

Design Emphasis 45 credits — 133 total credits

Industrial Organization	3	Labor Economics	3
Trigonometry	3	Architectural & Structural (or)	
Elements & Principles of Design	2	Graphic Arts Design	3
Physics I	3	Industrial Arts Practicum	4
Tools, Materials & Processes	3	Forces & Industrial Power	3
Analytical Geometry	3	Industry Study I	3
Machine Problems & Design	3	Industry Study II	3
Production Prob. & Design	3	Industry Study — Individual	3

Scientific Emphasis 47 credits — 135 total credits

Industrial Organization	3	Physics II	3
Trigonometry	3	Materials-Physical Analysis	3
Elements & Principles of Design	2	Graphic Analysis	3
Physics I	3	Materials-Electronic Anal. (or)	
Analytical Geometry	3	Metallurgy & Metallography	3
Tools, Materials & Processes	3	Industrial Arts Practicum	4
Labor Economics	3	Industry Study I	3
Forces & Industrial Power	3	Industry Study II	3
		Industry Study — Individual	3

Try the Technical Occupations

J. J. LITTRELL

- Among the better job opportunities today for young people are **semi-professional** or technical assistants to engineers, scientists, etc.
- This analysis of the need for curriculum and guidance revisions in programs of aeronautics, metallurgy, etc., offers a **five-point program** of what your school can do.

—U. S. Navy

What a fortunate person it is who knows he is employed in the type of work he wants and that he has received the necessary education and training to succeed and progress in the chosen occupation. What difficulties and anguish many young people experience in attempting to make an occupational choice! Yet, haven't young people always had this difficulty? Yes, this has of course been a difficult problem for youth of any generation where there have been numerous occupational fields from which to select.

The problem is somewhat magnified today however, since so many employers are looking for people with higher educational qualifications. Generally, they are not looking for people with just any form of education, rather they want people who have either had some special training, a certain sequence of courses, or some planned vocational program. Such education or training is expensive. A student is especially likely to notice this in preparing for the professional or near professional occupations. Not only are educational expenses continuing to spiral upward, but it is becoming difficult to be admitted to colleges and universities.

Among the many things for the individual to consider in making an occupational choice is the ever present problem of supply and demand, for in some fields of work the numbers employed tend to be limited. In addition he must carefully make his occupational selection in relation to his interests, finances, and capabilities.

If he doesn't, he may be like the man who was just about to graduate with a masters degree in the field of education when he decided he did not want to teach. Now after five years of teacher preparation he did not necessarily waste his time, vocationwise, for it is true that his education would help in lines of work other than teaching, but when he tries to enter the labor market in such fields as sales, business, or technology, he will find that he must compete with persons who have been more specifically trained for these fields. Five years of college would hardly be necessary to secure such employment, rather one or two years of concentrated directed training would not only be better but certainly more economical.

Among the better job opportunities for young people of today are the semi-professional or technical positions as assistants to such professional people as engineers, doctors, and scientists. Examples of these include industrial technicians, engineering technicians, chemical technicians, and medical technicians. These require training or education beyond high school. Since so many of today's high school graduates are interested in obtaining additional training and education perhaps it would be advisable for more of them to consider the possibility or given the opportunity to enter directly into technical education programs. For persons interested in spending one to four years in training beyond high school these positions offer a challenge and opportunity to progress in much needed work, and those employed in such positions may feel that they perform an important service to the labor market and the national economy.

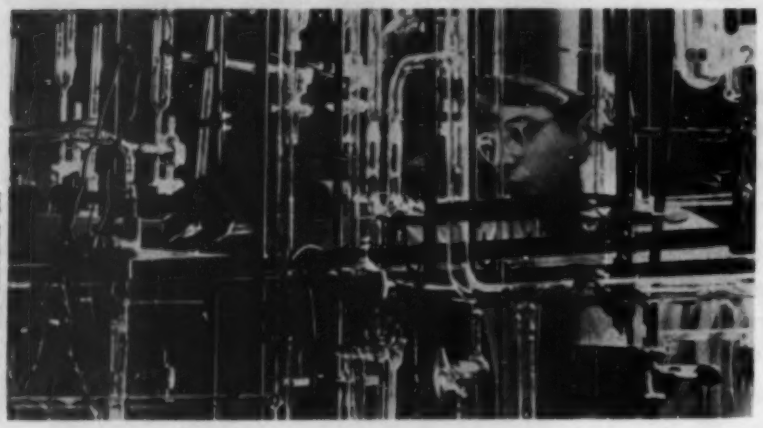
Every year hundreds of aspiring young people either find it necessary to drop out, or they are dropped from the college and universities' rolls in engineering, science, and medicine. Some of these people, after two or three years' study, have obtained sufficient training to qualify in the technical occupations. However, most must obtain more specific training in order to gain employment as technicians. Science and mathematics are generally needed by both the professional and semiprofessional personnel in the occupations considered here, but this does not mean that each group performs the same duties.

The President's Committee on Scientists and Engineers[1] has indicated that technicians have not only been

[1]The President's Committee on Scientists and Engineers, *Answer Your Engineering Manpower Problems*, Washington, D. C., (n.n), (n.d).

Dr. Littrell is associate professor of industrial arts, Arizona State University at Tempe.

To emphasize technical occupation training, schools might: (1) incorporate problem solving techniques which cut through several school departments; (2) study industrial quality control and such related fields as testing, instrumentation, etc.; (3) increase study in metallurgy, fluid mechanics, technical design, electronics, and aeronautics; (4) encourage technically interested girls to consider technical preparation, and (5)set up well-equipped laboratories.



— New York Life Insurance Co.

taking over duties formerly performed by professional people but are doing a better job than the professional people have been. The semiprofessional occupations require alert, intelligent, and conscientious people who must work with various instruments, mechanical apparatus, or testing equipment.

Examples of these semiprofessional occupations are draftsmen, designers, and technical computers who relieve engineers for other responsibilities; medical laboratory technicians who perform laboratory tests for doctors in private practice, hospitals, and pathology laboratories; and science assistants who perform tests with delicate instruments, the results being used or interpreted by professional scientists. Persons in these occupations often obtain their training from such places as the armed services, technical institutes, or colleges and universities. Several of the higher institutions are apparently trying to meet technical preparation needs through their industrial education curriculums. Thus, besides industrial education teacher training programs, they have been adding one to four year programs for training technicians.

The four-year or degree students in technicians' programs are expected to complete college general education requirements as well as the necessary math, science, and technical programs needed for technicians. Thus they approach the professional status. Since these technical programs are often conducted in laboratories that have been designed primarily for the education of industrial arts teachers there is often a lack of personnel, testing devices, and other needed technical equipment. This has been a factor in preventing such technical programs as connected with aeronautics, optics, metallurgy, and electronics from developing adequately.

The personnel and the way they enter the semiprofessional or technical occupations is not only a problem of curriculum and guidance for school people, but it is also a problem of economics for the country. It is unfortunate that so many youngsters set their goals for a professional career but *must* fail in their attempts. As an example consider a hypothetical yet typical case of a young man who is attending a large university with electrical engineering as his goal. After one or two years he finds that due to lack of finances, or ability, or for some such reason (take your choice) he must drop out of the engineering school.

His next move is toward that of becoming a technician in the electrical or electronics field. Perhaps he will be fortunate enough to obtain a position, but it is more likely that he will be asked to spend one or two more years getting sufficient training to prepare for initial employment. This becomes a time of frustrations and certainly expense for the boy and his family. Not only must additional time and money be spent, but even after he completes his training and accepts a position he still does not know if he will want to remain with that type of work. It wasn't his original choice and may not be at all what he wants to do.

Conservation of human resources should begin with vocational guidance. With the trend to place increased emphasis on science and mathematics in our secondary schools there is a further tendency to encourage these same mathematics and science students to enter our colleges and pursue such degree programs as found in engineering, medicine, and science. The resultant is to see these thousands of young people anxious to enter the "exciting" professional areas mentioned. Would it not be better for more of these people to be informed and acquainted with the semiprofessional occupations and encouraged to head directly toward these goals rather than to get there after dropping out of another program?

Women in Technical Occupations

Why are so few women receiving training in technical classes? There is little reason for women to be afraid of classes labeled mechanical, industrial, scientific, or mathematical. Yet that is what is happening in too many instances. Many women do not even know that they can enroll in classes in industrial arts, technology, or engineering. As a result employers often settle for poorly qualified male technicians when capable and well-trained women would be employed if available.

That women are not entering certain technical type of training may be seen, as an example, in a state university where of over 1000 students in a college of applied arts and science only 26 were women and of these women only two were in technical programs. Of course the opposite is seen in certain other technical fields, as that of medical technologists where women far outnumber men. However, hospitals, pathological laboratories, and doctors in private practice are anxiously looking for outstanding men as well as women technicians. Men find good opportunities as medical technologists not only in securing initial employment but in the opportunities for promotion as well. As one young male technologist explained in a recent study in St. Louis[2] he expected to assume a particular administrative position in the laboratory since a man was preferred. The study also showed that men were often preferred for certain

[2]Littrell, Joseph J., "Employment Requirements and Opportunities for Women as Technicians in the St. Louis Labor Market Area." Unpublished Doctor's dissertation, University of Missouri, Columbia, 1958.

positions because of shift work, lifting, or because they tend to stay with the positions better.

Exploratory Experiences in Technology

Industrial-arts teachers often complain that the academically inclined pupils do not enroll in their classes. Perhaps the movement to increase pupil load may help. Many schools are encouraging their better pupils to obtain from 18 to 22 high school units instead of 16 for graduation. Let us hope this will enable many of these pupils to elect certain industrial arts courses as part of their four year programs. If so, industrial arts teachers should encourage these pupils, both boys and girls, to enroll in their classes. However, when they get these pupils they need to provide meaningful and challenging problems for them. Not only may this help in identifying technically capable and interested people, but the pupils themselves should have more opportunity to explore facets of the technical phases of the working world.

The problem of obtaining maximum preparation of individuals as technicians for the labor market is not just that of guiding secondary school pupils through certain predetermined courses or curricula. Rather it may be more advisable for methods of instruction to have different emphasis. For example, the problem-solving technique is often either not used or it is misused in industrial-arts education when it could well be applied to group as well as individual instruction. In discovering and developing class problems there need to be more practices of correlation *within* departments as well as *between* departments. Such subject fields as industrial arts, mathematics, and physics may work together in locating pupils with the interest and ability to work with challenging problems and utilize the instruments commonly needed in the semiprofessional occupations.

Many of our professional magazines carry articles indicating excellent examples of this very thing. These may be in the nature of such things as projects concerning electronic devices, solar furnaces, telescopes, microscopes, the technical design of a community piece, or the application of scientific principles. Additional growth and possibly even survival of some local industrial education programs may mean improvement of this type of instruction. Industrial arts teacher training programs would be helped by putting emphasis on design, mathematics, physics, and chemistry. ◀

The Choices They Make

VIRGIL HOWES and DeGROFF PLATTE

- A vocational survey of San Diego County High School seniors regarding choices of careers.
- Read what factors influence occupational preferences, if the students believe the career information supplied them was adequate, etc.
- An unusual aspect of a district's guidance program, viewed from "the other side."

Give a vocational interest questionnaire to 6657 senior high school students. Ask each of them: "What career have you chosen? What influenced your choice? Do you feel that you have enough information about your chosen career? Will your high school program help you prepare for this occupation?" Compile the answers and see the careers youth choose and their opinions on the school's vocational program.

This study started in the spring of 1956 in San Diego County. It was first suggested by the local chapter of the American Society for Civil Engineers as a project to determine student choices and attitudes toward careers in science and engineering. From this the project developed and finally expanded into a general vocational survey on a county-wide basis. With the approval and support of the Association of San Diego County School Administrators, the project was under way.

A student questionnaire was developed using both forced and free-choice type response questions. High school principals, firmly supporting the project, asked teachers of English or social studies to administer the questionnaire in their classes according to the suggested guidelines.

Thirteen high schools participated. They ranged in size from 203 to 1,952 students and represented an entire cross section of social and economic groups. Some schools drew students from rural and rather isolated areas; others were located in "bedroom communities" near the metropolitan center.

Of the 6657 participants, 3367 were boys and 3290 were girls. They were students in grades ten, eleven, and twelve. Ninth graders were not included because of differences in administrative organization of the schools.

Career Choices

Results of the questionnaire

Dr. Platte is district's curriculum ant, special services, of the San Diego County, Calif., schools, and **Dr. Platte** is district's curriculum co-ordinator.

TABLE I. Girls' Vocational Choices and U. S. Employment

Major Occupational Group	Women in Labor Force (Per Cent)	Girls' Choices (Per Cent)
Professional Managerial	15.08	34.02
Clerical Sales	37.41	40.98
Service	40.73	17.62
Agricultural, Fishery, Forestry, and Kindred	5.08	0.41
Skilled	1.24	2.46
Semiskilled Unskilled	0.46	0.00
No choice		4.51

TABLE II. Boys' Vocational Choices and U. S. Employment

Major Occupational Group	Men in Labor Force (Per Cent)	Boys' Choices (Per Cent)
Professional Managerial	21.25	44.53
Clerical Sales	12.52	2.34
Service	27.58	16.41
Agricultural, Fishery, Forestry, and Kindred	11.97	10.94
Skilled	18.84	16.80
Semiskilled Unskilled	7.84	2.73
No choice		6.25

showed that 94.6 per cent of the students made vocational choices, with 73 different occupations listed. A comparison between vocations chosen by girls and the total number of women employed in each major occupation group is shown in Table I. Employment figures were taken from the report of the U. S. Census Bureau for 1956,[1] the year of the survey.

In the opinions of the students, liking a particular subject, observing people working in the job, and actual working conditions were of much greater influence than the other factors. A breakdown of responses from boys and from girls showed no significant difference in this pattern.

The Schools' Occupational Programs

An attempt was made to discover student feelings concerning the adequacy of vocational information offered them through the school program and through other sources. Students were asked to check each of six items: salary, training, security, working conditions, advancement and employment opportunities.

[1]U. S. Bureau of the Census, Statistical Abstract of the United States, 1956 (Washington, D. C.: Government Printing Office, 1956), p. 208, Table 252.

TABLE III. Factors Influencing Occupational Choice

Factor	Per Cent
Liking for a particular subject	74
Have watched people at work in this job	61
Working Conditions	56
Have had some work experience in this field	37
Parents or friends	35
Pay	35
Subjects required are easy	13

The percentage of high school girls choosing professional and managerial occupations was over twice that of women actually employed in this group. The only other occupational group showing such a marked discrepancy was that of service. Here the percent of girls' choices was less than half the percent of women actually employed in service occupations. Percentages of choices and of numbers employed in clerical and sales occupations were approximately the same.

Occupational choices made by high school boys are compared to percentages of men employed in major occupational groups in Table II.

Again, as with the girls, the percentage of boys choosing professional and managerial occupations was over twice the percentage actually employed. Boys' choices in the clerical sales and service occupations were low in comparison to the percentage actually employed. There was a difference of more than ten per cent for each of these groups.

Factors Influencing Occupational Choices

Students were asked to check which, if any, of seven items influenced their occupational choices. The percentage of students checking each item is shown in Table III.

At least one half of the students at each grade level felt they had enough information about the items listed. Although the "yes" responses increased with the grade level, differences were small and none of the six items showed a marked variance from each other in "yes" responses.

This feeling of satisfaction was also shown by students in their responses to, "Will your high school program help you in your chosen career?" From 70 to 84 per cent of students at all grade levels said yes. This was equally true for tenth graders as twelfth graders, for girls as for boys. In general, students felt fairly well-satisfied with the amount of vocational information they had and with the high school programs they were taking.

TABLE IV. Adequacy of Career Information

Item	Grade Level	Per Cent of Yes Response
Salary	10	53
	11	61
	12	65
Training	10	63
	11	69
	12	78
Security	10	50
	11	60
	12	67
Working Conditions	10	66
	11	74
	12	81
Advancement	10	56
	11	60
	12	68
Employment Opportunities	10	61
	11	68
	12	73

Conclusion

Questionnaire responses of 6657 students in grades ten, eleven, and twelve showed that: (1) over 94 per cent of the students in these grades listed an occupational choice; (2) a much higher per cent of girls chose professional and managerial occupations than the per cent of women actually employed in these fields, and a much lower per cent chose service occupations; (3) boys' choices showed a similar pattern but in addition their choices of clerical and sales occupations were much lower than the per cent of men actually employed; (4) major factors which students say influence their occupational choices are liking for a particular subject, observing people at work in the job, and the working conditions found; and (5) students, in general, feel they have enough information about their chosen occupations and that their high school programs will help them in their chosen careers.

One phase of the offset-printing process used in Hicksville High School is the "stripping" or mounting of negatives to produce the completed page or press form.

— Kenro Graphics, Inc.

▶ Through project-type courses and with up-to-date, quality equipment —

How Hicksville Teaches Graphic Arts

RAY ADAMS

In the area of vocational education, Hicksville High School, Hicksville, L. I., N. Y., attempts to achieve as complete a merger of theory and practice as is possible. Prime requisites to success in this merger and its ultimate objective — the training of the craftsmen of tomorrow's industry — are project-type courses and up-to-date, quality equipment.

Purpose of the Course

The purpose of our three-year printing course is to prepare the student in the basic skills required at whatever printing establishment he finds employment upon graduation. Our course is not a formalized, rigidly planned one. We use instead the individual and class project-type of training. By this method, we feel we accomplish what a more extensive combination lecture and on-the-job training program attempts to achieve. Instruction and arrangement and assignment of projects is flexible — tailored to each student's capacity and desire to learn.

A four- to five-month indoctrination period for our first year students is devoted to a general familiarization with the various broad aspects of the graphic arts and their associated equipments. In this first year the student is introduced to all the basic methods or techniques employed in both lithography and letter-press printing. The first year student observes the work of the more advanced and senior students, and works along with them. Guidance discussions are conducted dealing with the job opportunities among companies in the nearby communities. Such things as wage scales, supply and demand, and advancement opportunities are discussed. Based on this foundation and his own interest and ability, the student decides for himself by the end of the first year in what area he would like to concentrate his efforts.

Semi-Specialization

Instruction in a specialty is not allowed to become too narrow, however. In his second year the student continues to work in all areas of the printing process, with heaviest job emphasis on the specific area he has chosen, such as press work or camera or platemaking. An inclination toward camera work, for example, would include instruction in general photo-mechanical subjects such as basic news photography, preparation of copy for the process camera, enlarging, ruling forms and stripping. In addition he would continue to work with platemaking, offset press work, make-up, and proofreading.

If at the end of the student's second year he has displayed outstanding ability, he is made a production engineer and placed in charge of an entire project, such as the class yearbook — a role that could lead to further training at a technical college level.

Finally, at the end of the three-year course, each member of a class

Mr. Adams is chairman of the graphic arts department at the Hicksville High School, Hicksville, New York.

The final step in printing the Hicksville Comet is the clamping of the aluminum plate with the positive image on it to the plate cylinder of the offset press.

(seldom numbering more than 15) has had an opportunity to become familiar with the maintenance and use of each "tool of the trade," from a piece of "furniture" to the line-casting machine; from a 4" x 5" press camera to the larger more complex ones. In addition, he usually has an area of specialization; but, most important of all, he knows the relationship of each part to the complete whole — the finished, printed article.

Vocational school faculties offering graphic-arts instruction should consider the current trend, among commercial and in-plant printing and duplicating shops, to combination offset-letterpress capabilities. This trend includes greater self-reliance in the production of negatives for offset platemaking, and, in turn, increasing use of the economical vertical, process camera which is capable of producing, size-wise, over 90 per cent of all offset negative requirements. Acquisition of such equipment is eliminating the print shop's reliance and dependency on an outside source for negatives. Savings in negative costs and smooth flowing operations result. For these reasons we feel that preparation of students for today's practical printing requirements makes it necessary that the curriculum include projects involving instruction and practice in all phases of negative making.

Superior Equipment

Our graphic-arts department is well equipped with both offset and letterpress equipment. Six platen presses, a Linotype, a Varitype, an ATF Chief 20, a Multilith, a Kenro "Vertical 18" process camera, stripping table, and nuArc Rapid Printer (platemaker) constitute the larger items of equipment — items we believe are necessary to a modern, well-rounded foundation in the graphic arts.

The Hicksville High School newspaper, the Comet, serves as an example of a project with which students have had considerable success. This tabloid size, offset-printed sheet, published monthly and running 8 or more pages in length, has considerable halftone work scattered throughout its newsful pages. The layout of pages, setting of type, pulling of reproduction proofs, making paste-ups, and stripping in of half-tones and line negatives are all done by students. Much of the original photography and, of course, all written material for the articles is also student work.

How Negatives Are Made

One of the most interesting and challenging parts of the overall project is the making of negatives from which the offset printing plates will be made.

The procedure begins with the student re-sizing the original copy to the negative size ultimately required. The student measures the original and also determines the image area required. By referring to the size and focus chart, the percent reduction is matched to the correct lens and copyboard number settings. These settings are then cranked into the camera. By so doing, the operator automatically sets the camera for correct size and focus and is ready to shoot.

Film is loaded into the film head in the darkroom. The head is placed in position on the camera, which may be operated either inside or outside the darkroom.

The original of the copy is then placed on the copyboard. To assure proper lighting and image sharpness, the copyboard is fitted with a polished plate glass cover which holds the copy flat and true.

Exposure of line negatives is merely a matter of setting a dial for the proper time interval and pressing a "start" button. The automatic timer stops the exposure. In the production of a halftone negative by either the autoscreen or contact screen method, flashing is also required. Briefly, flash exposure is a technique used together with the normal exposing procedure to assure clean printing black areas. Solid black areas in a halftone look good, but if any are larger than the size of a ten-cent piece, tend to muddy the entire picture. Or they "pick," because no water (in the case of offset), is being carried in that area of the plate. By flashing a halftone with a light colored piece of paper, usually white, a small black dot is forced into that portion of the film where the black area of the copy normally would not expose the film. Without flashing, that area would be clear in the finished negative and would print solid black.

With the use of a "grey tone" scale, developing requires very little skill; just good eyesight and visual judgment. The squares of the scale photographed on the negative develop at the same rate as the copy image, progressing in darkness (density) in a horizontal manner across the scale. When the proper amount of solid black area appears in the square specified, the negative is properly developed to the correct density and ready for fixing and washing.

The line and halftone negatives are then stripped on goldenrod (opaque mounting paper) to conform to the layout, following standard lithographic techniques. After stripping, the negatives are opaqued. They are then ready for burning in on a presensitized aluminum offset plate held in a printing frame. After exposure the plate is developed and then clamped to the printing cylinder of the press. In offset, little or no makeready problems exist as compared to letterpress. Therefore, once plates are made, little time is consumed before the student has the finished job in hand.

The completed newspaper represents the sum of all related student projects. It is tangible evidence to the student of how all parts fit into the whole and how interrelated and interdependent these parts are. Such integrated projects achieve what pure theory or piecemeal work would not accomplish. In short, we find that our project type courses prepare the student to take his place in the printing trade upon graduation with a maximum of practical knowledge.

On Improving Your Tests

ERNEST L. MINELLI

- The use of educational measurement may be falling far short of potential value because very little material is available on test construction for the teacher.
- In practical detail, here is a review of one important phase of test construction — how to determine and select test items which discriminate between the good and the poor students.

It is well known and unfortunate that the use of educational measurement falls far short of its potential effectiveness. There has long been an urgent need for the improvement of ordinary classroom tests. Although the classroom teacher has recognized and is fully cognizant of this need for scrutinizing his tests, too often he has failed to do something about it.

In recent years research in this field has made rapid progress. Adequate references and instructional materials on the theory and technique of educational measurement are readily accessible. However, much that is of real value in this field has been written and published for the professional test constructor, and is primarily concerned with mathematical theory. Not only has most of what has been written been geared to the professional worker in test construction, but there are also very few educational institutions offering systematic courses in educational measurement as part of the preparation necessary for their prospective teachers.

The task, then, is one of providing written materials concerned with what might be described as test construction for the classroom teacher. This article will deal with one phase of test construction. Basically, the article will concern itself with the problem of selecting test items which will do the job — determining and selecting test items which discriminate between the good and the poor students. An attempt will be made to present approximation methods for item selection whereby busy teachers may profitably make use of them for improving ordinary classroom tests.

Working Questions

For many years the professional worker in test construction has recognized the need for selecting working questions that do the job. Many statistical procedures have been developed to obtain refined and precise values or indices of discrimination which may be used for item selection. Unfortunately, the busy teacher does not have the time to master these statistical procedures since these processes provide revealing data only at the expense of considerable time and labor.

For this reason, an effort has been made in this article to present item selection techniques which are so simple and require so little labor and time that the busy teacher may profitably make use of them for improving ordinary classroom tests. This by no means suggests that statistical techniques for item selection are impractical; it merely infers that they are not always widely understood or comprehended, and, therefore, little effort is made to use them.

Item Analysis

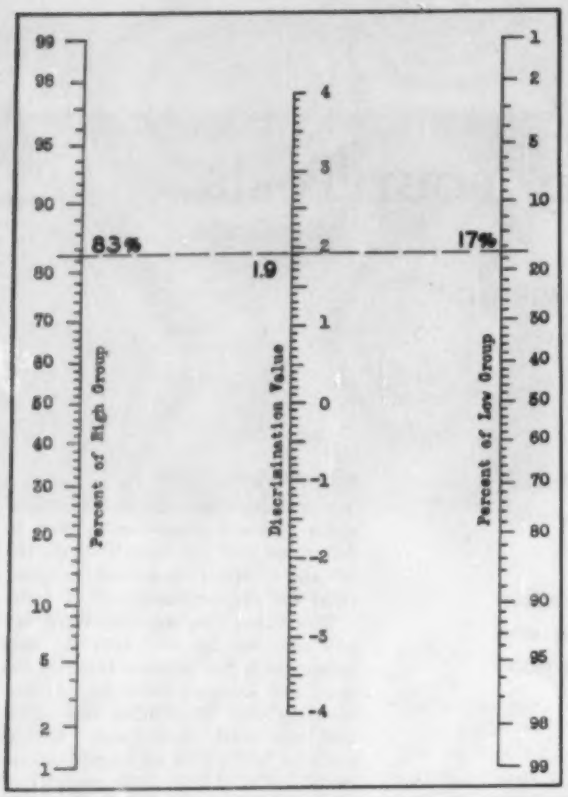
It is apropos at this point to repeat again that our objective is: how to determine test questions that do the job and to select these working questions for the improvement of tests.

Specifically, we are interested in: (1) determining and selecting test items which discriminate between the good and the poor students, (2) discovering and eliminating test items that are overly easy, and (3) uncovering and excluding items that are overly difficult. An item analysis of either a tryout test (one being used for the first time) or a test which may have been used previously will help us do the job.

First, basic to all item analysis is the selection of the criterion of comparison to be used in the analysis. Simplest of the criterion measures is the use of the total test score as a basis for this comparison. Therefore, the total test score shall be used as the criterion for comparison in this case. After selecting the basis upon which the item comparison will be made and after the test has been given and scored, the test papers must be grouped or arranged for this comparison.

Starting with the highest score to the lowest score made on the test, the papers are arranged from highest to lowest in descending order based upon the total score. From the pile of papers, simply tally the individual correct responses to each item. A simple table can be used for this purpose (see Table 1). Beginning with the highest total score, in this case 19, tabulate the items which have been answered correctly by the student. Each item the student has cor-

Dr. Minelli is associate professor of industrial arts at Central Michigan College at Mount Pleasant.



Below: **TABLE 1. Tabulation of Items Answered Correctly by Each Student**

Students	Items 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total Score
1	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	19
2	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	18
3	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		18
4	x		x		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	17
5	x	x	x		x	x	x	x	x	x		x	x	x	x		x	x	x	x	17
6	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		17
7	x		x	x		x	x	x	x		x	x	x	x	x		x	x	x	x	16
8	x	x	x		x	x	x		x	x	x	x		x	x		x	x	x	x	16
9		x	x	x		x	x	x		x		x	x	x	x	x	x	x	x		15
10	x		x		x	x	x	x		x		x	x	x		x	x	x	x	x	15
11	x		x	x		x	x		x	x	x	x	x			x	x		x	x	14
12		x			x		x		x		x	x	x	x	x	x	x	x	x	x	14
13		x	x		x	x		x	x	x	x			x	x	x		x	x	x	14
14	x			x	x	x	x	x		x		x	x		x	x	x		x		13
15		x	x				x		x	x		x	x	x	x		x	x	x	x	13
16	x			x		x	x			x	x	x	x	x			x	x	x	x	13
17		x	x	x	x	x	x		x			x	x		x		x	x			12
18			x	x	x		x	x			x		x	x	x	x			x	x	12
19		x		x		x		x	x	x		x		x		x		x	x	x	12
20		x		x	x	x		x		x	x		x		x		x	x			11
21		x	x				x		x			x		x		x	x	x	x	x	11
22				x		x			x	x	x		x	x	x		x			x	10
23		x				x	x	x			x	x	x			x	x		x		10
24				x	x	x		x		x					x					x	8
Total	24																				

Left: **FIGURE 2. A Nomograph for Answering Discriminating Values to Test Questions**

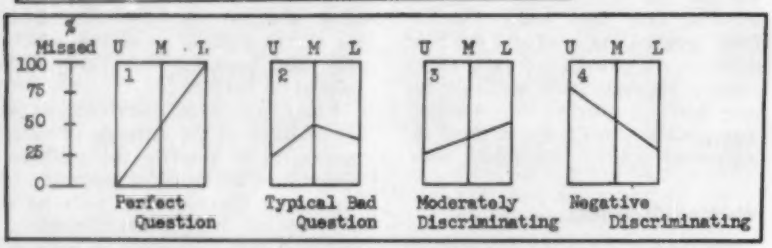


FIGURE 1. Graphic treatment for Determining Working Questions

rect is indicated by a cross in the appropriate item column. This process is repeated for the remaining 23 test papers. Table I shows which items have been answered correctly by each student; it also includes his total score.

After all items have been recorded it is a relatively simple task to determine the discriminating value of each item or to select the working question.

Determining Discriminating Values or Working Questions

The procedures described in the paragraphs to follow are similar to those used in most item-analysis techniques. Refined and precise statistical techniques have been omitted for reasons already discussed.

Top Half. Simplest of these methods for determining discriminating value or which items to use is the selection of items which have been answered correctly only by the best students. For example, this can be done by drawing a line dividing the test results, Table I, into two equal halves. Since there are 24 cases, students from 1 to 12 will constitute the upper half; the remaining 12 will make up the lower half. Count the number of correct responses for each item for each half and select only those which the upper, or better, half of the class scored highest on. Since the scores are in descending order, it is logical then to assume that any item on which the lower group scored higher than the top group should be revised or eliminated from the test. Using the first item tabulated in Table I as an illustration, we find the upper group scoring 10, while the lower group has scored only 2. We can, without reservation, say our item is a good discriminator. Item Four is an example of one which should be revised or eliminated from the test.

Graphical. Another method by which to uncover the working item is a simple graphical treatment for each item. This method shows graphically the respective percentages of upper, middle, and lower students getting the question wrong. On the basis of the total number of students who have taken the test, divide this total into three equal parts and compute the respective percentages for items missed in each part. For example, from Table I, divide the total number of students into three equal groups. Since there are 24 cases, students from one to eight will constitute the upper group, 9 to 16 the middle group, and 17 to 24 the lower group. Compute the respective percentages for items missed in each of these groups. After the percentages have been found, graph the results for each group. A perfect discriminating question would be one in which none of the upper group, half of the middle group, and all of the lower group missed the right answer. This process is illustrated in Figure 1 for the first four items tabulated in Table I showing examples of good and poor discriminators.[1]

Select only the positive discriminators; negative discriminators and items showing no discrimination should be revised or eliminated from the test.

[1]Theodore Caplow, "The Improvement of Examinations: A Narrative Comment," *American Association of University Professors Bulletin*, XXXVII (Spring, 1951), 60–62.

Nomograph. A third and final method reported here for determining the discriminating item is the use of the nomograph developed by Lawshe.[2] Figure 2 shows this nomograph which was designed to assign discrimination values to individual test items.

The first step when using the nomograph is to divide the test results, Table I, into two equal groups (high and low) as before. Second, compute the percentage of successful responses to a given item by each group. Next locate these percentage points on the nomograph using the left scale for the high group and the right scale for the low group. By placing a straightedge across these two points the discrimination value will be found on the middle scale at the point where the straightedge intersects it. To illustrate, using the first item from Table I we find in the high group 83 per cent marked the item correctly. In the low group the figure was 17 per cent. By joining these two points on the scales with a straightedge we read the discrimination value in this case to be 1.9. Lawshe suggests that items having discrimination values of less than 0.3 or 0.4 should be revised or eliminated from the test.[3] Thus, item one is an example of a good discriminator or working question and should be retained as one of the test items.

Paramount Goal

In concluding, it is well to emphasize that no attempt was made to present refined procedures necessary for the professional test constructor.[4] No mention was made of correction for chance success, items that may have been omitted, or items not reached on the test. Also, formulas for computing and obtaining corrected percentages for the above have not been included.

The paramount goal was to present approximation methods for item selection which busy teachers could profitably use for improving ordinary classroom tests. The fact that these techniques are approximation methods and are subject to a variety of errors should not deter teachers from making use of them. ◀

[2]C. H. Lawshe, Jr., "A Nomograph for Estimating the Validity of Test Items," *The Journal of Applied Psychology*, XXVI (Dec., 1942), 847.

[3]C. H. Lawshe, Jr., *Principles of Personnel Testing* (New York: McGraw-Hill Book Company, Inc., 1948), p. 190.

[4]For complete treatment of the subject, the following references may be found useful: Harold Gulliksen, *Theory of Mental Tests* (New York: John Wiley & Sons, Inc., 1950), pp. 371–373; E. F. Lindquist (ed.), *Educational Measurement* (Menasha: George Banta Publishing Company, 1951), pp. 268–285; William J. Michaels and M. Ray Karnes, *Measuring Educational Achievement* (New York: McGraw-Hill Book Company, Inc., 1950), pp. 454–483.

▶ the advantages and "how-to" of the —

Student Syllabus

CONRAD MAYER

Secondary school instructors who are not now using the student syllabus method throughout the school year will be enthusiastic after once trying this method. Such a syllabus, written by the instructor for frequent referral by his students, is an integral part of the course of study for which it is written.

Its intended purposes are: (1) to promote better class organization and administration on the part of the teacher; (2) to assist the teacher in maintaining the effective discipline so necessary to superior teaching; (3) to improve the student's study habits; (4) to assist the student in the logical arrangement of class notes dealing with a specific phase of instruction; (5) to instill a better understanding of course procedures on the part of the student, thus helping him to govern his conduct accordingly; and (6) to save the student's time by providing him with, in readily-available form, the answers to many routine questions.

Preparation

The instructor must first realize that he is preparing the syllabus mainly for secondary school students, and therefore he should make every effort to write in clear, concise language on the level of those students.

If the instructor prefers another name than "syllabus," he may title his explanation "student class manual." In either case, this information is to become the permanent possession of the student.

This writer's experience indicates that the most practical and inexpensive procedure for preparing the syllabus is to multigraph or mimeograph the information on 8½ by 11 paper, punch holes which fit the type of notebook to be used in class, assemble the pages, and staple them together with one staple in the upper left hand corner of each set.

Method of Use

The most successful method of presenting the information contained in the syllabus is to integrate the syllabus directly into the course of study of the class for which it has been developed. Thus on the first day of class, the instructor hands out a complete syllabus to each student. He should now tell them that they are to keep the syllabus in their notebooks at all times and should refer to it whenever problems arise relevant to class procedures or their conduct in class.

A good teaching technique also requires the assignment for study of specific parts of the syllabus before each class discussion. In the writer's opinion, it would be a mistake to attempt to teach the contents of the entire syllabus during the first few meetings of the class. Instead, the best procedure is to assign and discuss only those topics which will be used on a particular day or which will be used in the immediate future. For example, the "examinations" topic in the syllabus would not be discussed in class until just prior to announcement of the first test.

Instructors desiring to measure the extent of their students' understanding of the syllabus should develop a test which reveals knowledge of the entire contents of the syllabus or separate tests on its component parts.

The syllabus is especially valuable to the instructor and to the student during the first several meetings of the class. It is valuable to the in-

Mr. Mayer is director of the Vocational and Adult School, Two Rivers, Wisconsin.

structor as an organizational aid which will assure his not overlooking any small but important details of class administration. It is also valuable to the students, most of whom are attempting to orientate themselves to a new situation.

Parents observing the notebooks when students bring them home for reference will be quick to note that the teacher has a systematic and logical way of presenting information.

Most school administrators, too, will be pleased to know that the instructor has carefully written out directions which will increase efficiency of class operation. However, the greatest value of the syllabus is its presentation of a complete list of safety rules, not only as they pertain to the shop but also to fire and to civil defense as well.

Instructors will find that they will enjoy a greater sense of teaching security knowing that each student has in his hands a comprehensive list of safety rules. This list is especially important to an instructor if a student who has become involved in an accident attempts to claim, for instance, "I was never informed that I should wear an eyeshield whenever I was operating a machine."

Syllabus Contents

The instructor who desires to develop a student syllabus or class manual in his subject area will want to consider inclusion of the following general topic headings: Title Page, Introduction, Orientation, Definition of Course, Purpose, Vocational Value, Equipment Assigned by School, Equipment Furnished by Student, Procedure for Entering Room, Procedure for Leaving Room, General Rules, Safety Procedures, Discipline, Make-Up Work, Examinations, and Marking System.

The following synopsis of a syllabus in machine shop will serve as a guide to instructors desiring to prepare a similar manual for whatever field they are teaching:

1. *Title Page.* (The information given below for this topic heading is merely for the assistance of the instructor in preparing a title page.) The syllabus is made attractive by reproducing the title page on colored paper. That title page may then include the name of the subject being taught, followed by the word "syllabus." Other items to consider for the title page are as follows: instructor's name, department or name of course, department head, date, room number, and name and location of school.

2. *Introduction.* (The content in the remaining topic headings is composed of excerpts taken directly from this writer's machine shop syllabus. Each reader should, of course, adapt and expand this content to meet his individual instructional needs.) The instructor takes this opportunity to welcome you as a member of his class in machine shop. This information will help you achieve maximum personal development, help you understand the procedures used in class so that you can govern your conduct accordingly, and save you time. (etc.)

3. *Orientation.* The name of this course is Machine Shop 1M. It is the second-year machine shop course offered in the Technical Division Curriculum.

The city of (herein insert name of city) has provided you with excellent facilities for learning in machine shop. The machines available to you are as follows: (The instructor here lists the quantity and names of the machines in the department).

4. *Definition of Course.* The machine shop is a place where metal parts and sometimes other materials are cut to a required size and put together to form mechanical units, commonly called machines. (etc.)

5. *Purpose.* The purpose of this course is to give you a background in machine shop work, thus providing you with information and skills that you will find valuable in qualifying for employment. (etc.)

6. *Vocational Value.* The employment outlook for young men interested in machine shop and its related fields is good. (etc.)

7. *Equipment Assigned by School.* The board of education of the city of (name of city) has provided you with the following equipment for your personal use in the shop:

Quantity	*Item*	*Value*
2	5/16 in. toolbits	$ .45 @
(etc.)		

You are expected to use this equipment in an intelligent manner, and you will be responsible for its safe return upon completion of the course. (etc.)

8. *Equipment Furnished by Student.* You will provide yourselves with the following four items for use in the class: (Instructor lists items which apply).

The absolute deadline at which you must have this equipment in class is (date) ——. (The student writes in the date when the teacher directs him to do so.)

9. *Procedure for Entering Room.*

1. Enter in an orderly and businesslike manner.

2. Go immediately to you locker.

Open your locker and put on your apron. Then remove your notebook and any other material that you will need for work that day. Put other books or items not relating to your work into your locker and lock it to prevent loss of your personal property.

3. (etc.).

10. *Procedure for Leaving Room.*

1. The timekeeper will announce "cleanup" at the proper time.

2. Stop work.

Put away immediately all your tools, equipment, and materials at the moment "cleanup" is announced. Place your own property in your locker and return the tools you were using to their proper places.

3. (etc.).

11. *General Rules.* Wherever man has grouped together, it has been found that certain rules and regulations govern his behavior. (etc.) (After further background on the need of rules for group activity, the instructor lists the rules.)

12. *Safety Procedures.* A fully competent mechanic knows not only the technical aspects of his trade but also the safety precautions.

(Here the instructor stresses the importance of safety. He then explains in detailed steps safety procedures, which can be divided into the following headings: shop conduct, personal protection, compressed air, health, housekeeping, hand tools, and machine tools.)

13. *Discipline.* Your infraction of the rules and regulations of this shop may result in detentions, being sent to the "office," or eventual dismissal from class. (etc.)

14. *Make-Up Work.* If you desire to work more than the regular class hours, or if you find that you cannot keep up to minimum assignments, you will have an opportunity each week to do make-up work. (etc.)

15. *Examinations.* Exams are given to measure the degree of achievement that you have attained in the study of related information for machine shop. (etc.)

16. *Marking System.* Unless I otherwise specify, your machine shop grades will be based on the following factors:

1. The number and quality of projects which you have completed.

2. Your grades in examinations given during the course.

3. (etc.)

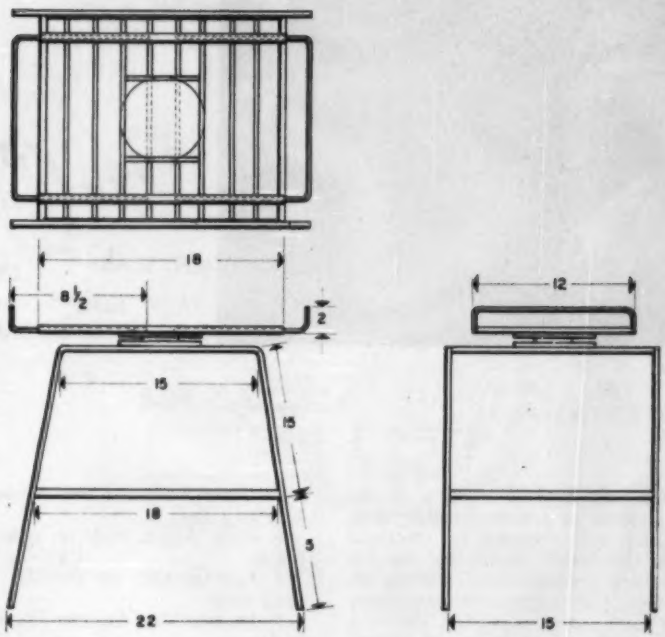
An instructor who has ready at the beginning of the school year a syllabus designed in accordance with the aforementioned suggestions — and uses it effectively — will be rewarded by increased efficiency of his students and the knowledge that he teaches his course in a systematic, safe manner.

TV SET SWIVEL STAND

NED FRISBIE
Instructor, Industrial Arts
Bryan, Ohio, High School

Considering* the overwhelming trend in television receiver purchasing from consoles to table models, there is a corresponding need for stands on which the table sets can be placed.

This swivel TV stand, adjustable to hold even the bigger screen models as well as the "slim line" sets which are becoming so popular, is simple, attractive, durable, and certainly easy to keep dusted. A good exercise in welding, the stand compares favorably with most of the stands now commercially available.



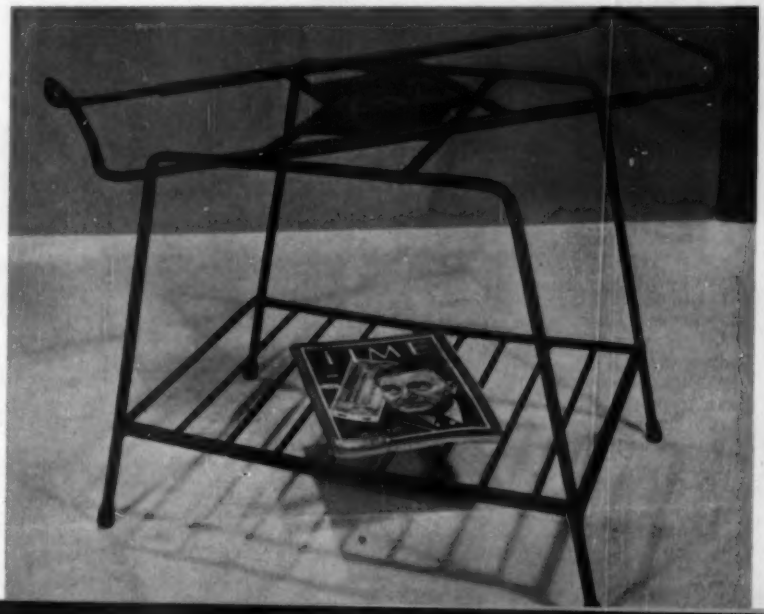
Bill of Materials

No. of Pcs.	Name of Part	Material	Size
2	Legs	Mild steel	⅜ square x 55
2	Cross braces (Top of base)	Mild steel	⅜ square x 15
2	Cross brace (Swivel platform)	Mild steel	⅜ square x 12
4	Swivel braces	Mild steel	⅜ square x 6
1	Shelf frame	Angle iron	⅛ x ½ x ½ x 66
8	Shelf cross-pieces	Mild steel	⅜ round x 15
2	Swivel-platform extensions	Mild steel	⅜ round x 33
2	Swivel-platform sides	Pipe	¼ diameter x 18
1		Swivel	6 in.
4		Rubber cane tips	⅜ in.

*Adapted from the recently released book, ***Modern Wrought Iron Furniture*** by Ned Frisbie, The Bruce Publishing Co., 400 No. Broadway, Milwaukee, Wis., cloth, 92 pp., $2.80.

Procedure

1. Study the drawing.
2. Bend the legs.
3. Cut 45-deg. angles out of the angle iron for the corners.
4. Weld the angle iron into a rectangle for a shelf.
5. Weld the rods into the shelf.
6. Weld the top braces to the legs.
7. Weld the shelf in place.
8. Weld the swivel to the legs.
9. Weld the braces to the pipe.
10. Bend the swivel-platform extensions. The extensions should slide freely.
11. Weld the top to the swivel.
12. File all the beads.
13. Paint the wrought iron flat black.
14. Put on the rubber cane tips.



NIGHT LIGHT

LYNN MICKELSON, JR.
Instructor, Industrial Arts
Ballard High School, Seattle, Wash.

This lamp is designed as a project for students in a general metals shop. The skill level necessary for successful completion would require that the student have previous metal working experience. The student will gain experience in foundry, machining, electrical, sheet-metal work, drilling, and tapping.

The night lamp is a functional yet attractively decorative object. The aluminum body and plastic top provide a light weight hand lamp which illuminates when lifted.

This battery powered lamp has many uses about the house. Its contemporary lines grace the TV while providing a handy light when operating the dials. It is useful also in the bedroom as it provides an unobstrusive guide in the darkness.

Construction Procedure

A. Body of the lamp

1. Cut 1¼-in. tubing to length, smooth ends.
2. Drill securing holes in tubing to act as anchor points for the base.
3. Use scotch tape to cover holes on the *inside* of tubing.
4. Place body in drag with pattern and fill with sand (both body and drag).
5. Invert drag and remove pattern.
6. Cut pouring hole, gate, form a safety wall, pour base.
7. Use 1⅛ OD pipe as a jig to hold lamp body in lathe.
8. Center jig in lathe, then ram lamp body onto jig.
9. Face bottom of lamp, turn base down to proper diameter.
10. Cut curvature into lamp base.
11. Cut bottom plate recess, smooth interior.
12. Finish body and base as desired.

B. Plastic top

1. Place 1¼-in. rod in lathe and center.
2. Face off end, cut shoulder to fit lamp body.
3. Machine to diameter to match body.
4. Polish or frost surface as desired.
5. Drill a pilot hole for the bulb chamber, drill out using end mill.
6. Polish or frost as desired.
7. Cut rod off.
8. Machine taper on top, finish as desired.

C. Bottom plate

1. Cut material and drill holes to fit bottom plate jig.
2. Machine plate to fit lamp base recess.
3. Drill holes for switch and base plate holding screws.
4. Drill holes in lamp base for bottom plate hold down screws.
5. Counter-sink holes in the base plate.
6. Tap 4-40 threads in lamp base.

D. Lamp mounting bracket

1. Lay out the bracket.
2. Drill bulb hole.
3. Cut triangular bulb relief holes using a cold chisel.
4. Cut out the bracket.
5. Bend the flanges to shape.

E. Battery spring

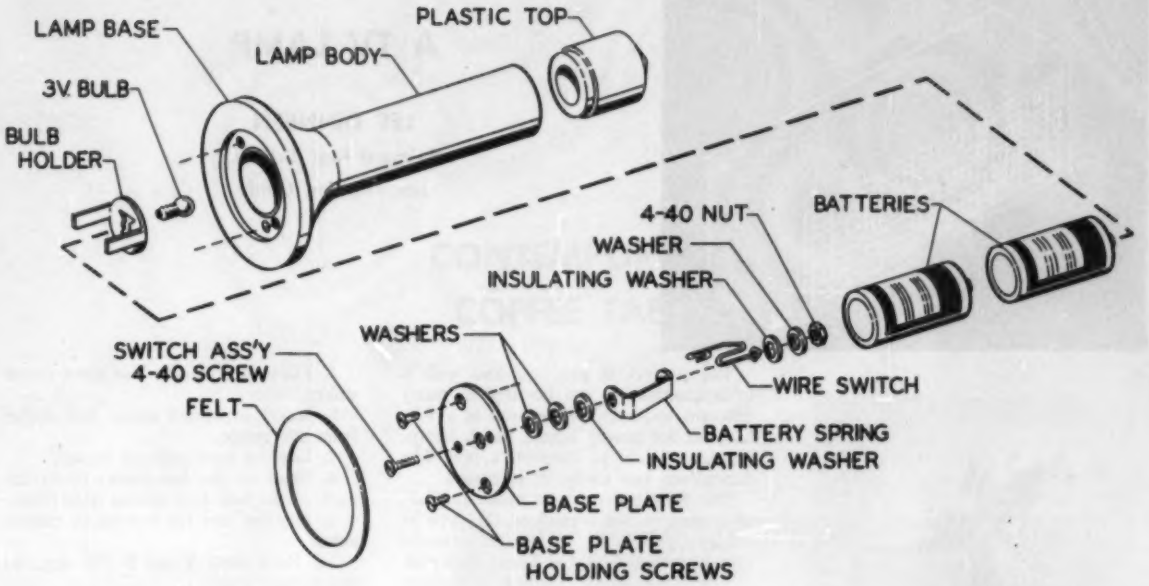
1. Lay out the spring and center-punch the hole.
2. Drill the hole.
3. Cut out the spring, smooth edges.

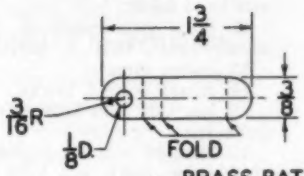
F. Assembly

1. Press fit the plastic top to the lamp body.
2. Assemble wire switch, battery spring and bottom plate assembly.
3. Put lamp bracket and bulb in lamp with batteries.
4. Screw base plate in place.
5. Cut and glue felt pad to bottom of lamp.

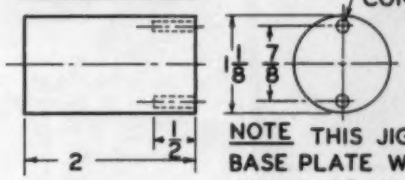
Bill of Materials

No. of Pcs.	*Name of Part*	*Material*	*Size*	*Gauge No.*
1	Body	Aluminum Tubing	5¼ x 1¼	od
1	Base	Aluminum Scrap	½ lb. of Scrap	
1	Bulb Holder	Steel	1 1/16 x 2 9/16	26
1	Base Plate	Aluminum	2 x 2	16
1	Battery Spring	Brass	⅜ x 1⅜	24
1	Switch Wire	Spring Steel	3	20
1	Plastic Top	Plastic Rod	1¼ x 1¼	
1	Light Bulb		3 Volt	
2	Batteries		Size "c"	
3	Screws		4–40 Flat Head	
1	Nut		4–40	
3	Washers		⅜	
2	Insulating Washers		⅜	
1	Felt		3½ x 3½	



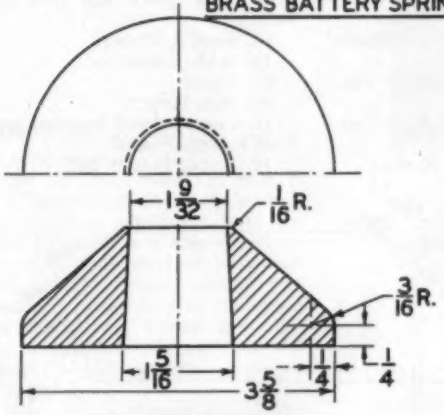


BASE PLATE JIG

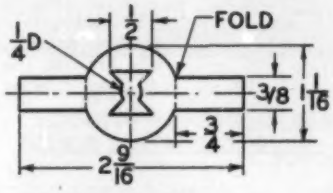


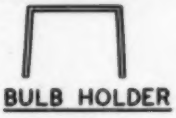
NOTE THIS JIG USED TO HOLD BASE PLATE WHILE MACHINING—USE MILD STEEL

BRASS BATTERY SPRING



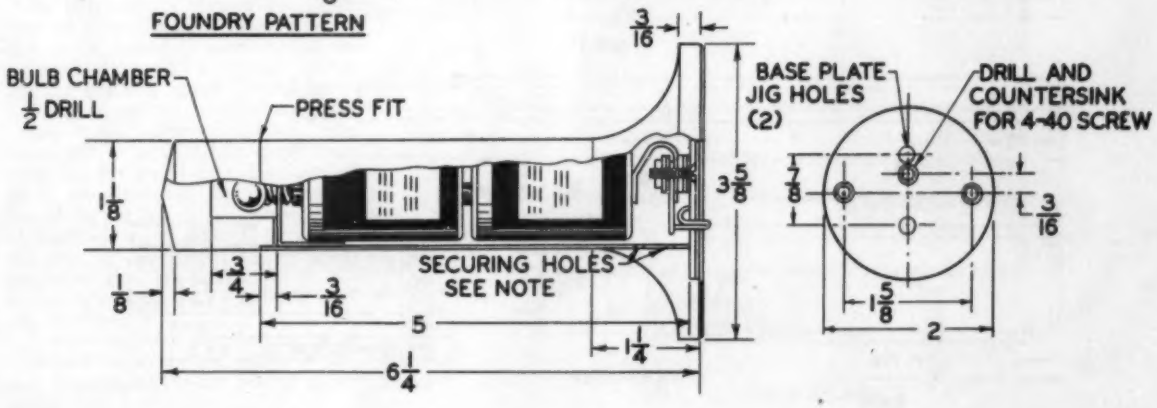
FOUNDRY PATTERN

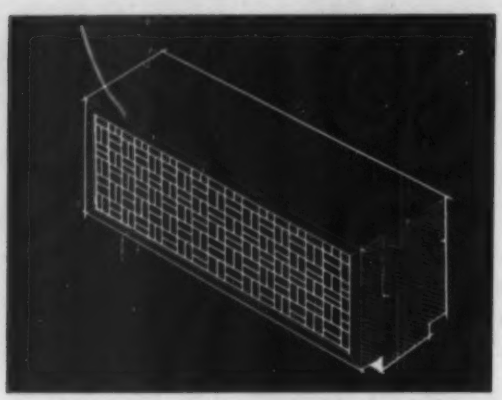




BULB HOLDER

WIRE SPRING SWITCH
NOT TO SCALE
BEND TO FIT





A TV LAMP

LEE DINNEEN
Belmont High School,
Los Angeles, Calif.

The project is practical and with a little imagination can be used in many different ways. It can be used as a T.V. lamp or for pin-up lamps, porch lamps, or night lights, to mention a few. The dimensions can easily be increased.

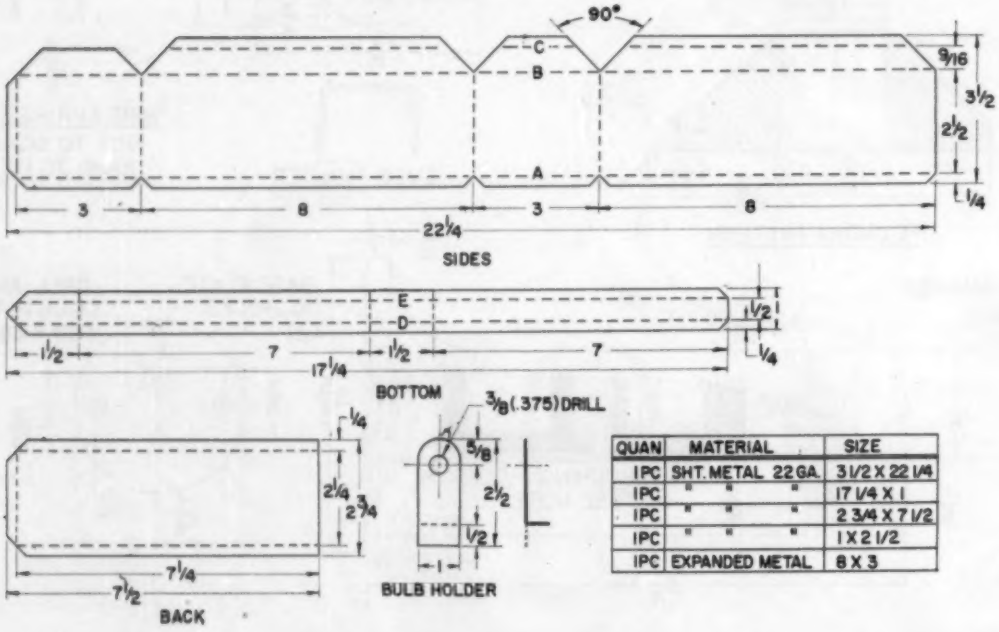
The time necessary to make the job, of course, would depend on the type of student you have; an estimate would be approximately three weeks, however.

There are many learning situations: layout, use of basic sheet metal hand tools and machines, soldering, finishing, etc.

The material used for the project can be cut from a standard sheet with a minimum of waste. The bottoms and the backs can be cut from scrap. Odd pieces of expanded metal can also be used.

Procedure

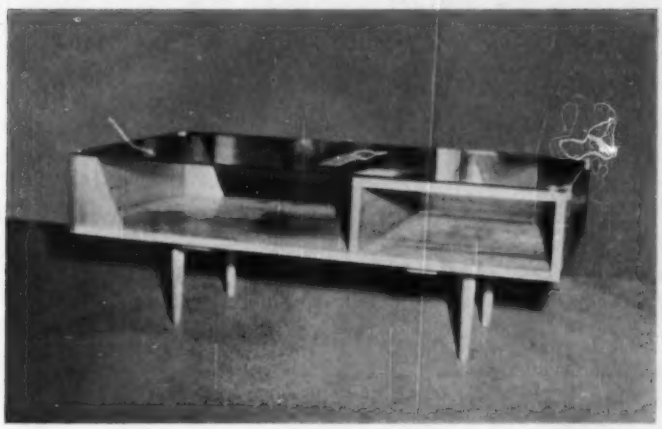
1. Lay out sides and cut to dimensions.
2. Bend along line A and B 90 deg., in the cornice brake.
3. Bend line C 135 deg., in the opposite direction. Use cornice brake.
4. Bend soldering flap D 90 deg.
5. Form into square. Use sheet metal stakes.
6. Insert expanded metal and solder from the inside.
7. Lay out back and cut to size.
8. Bend on the bar folder to fit the back of the box. Part should slide freely.
9. Lay out and cut bottom to dimensions.
10. Bend lines A and B 180 deg., on the cornice brake.
11. Bend soldering flap C 90 deg., with hand folder.
12. Form into square on the sheet metal stakes.
13. Solder corner.
14. Attach bottom. Solder.
15. Lay out bulb holder and cut to dimensions.
16. Drill ⅜ hole for a short section of ⅛ pipe which will hold the light socket.
17. Bend A 90 deg.
18. Solder inside box.
19. Finish.
20. Wire lamp.
21. Insert colored fireproof paper behind expanded metal.
22. Install 25-watt bulb.

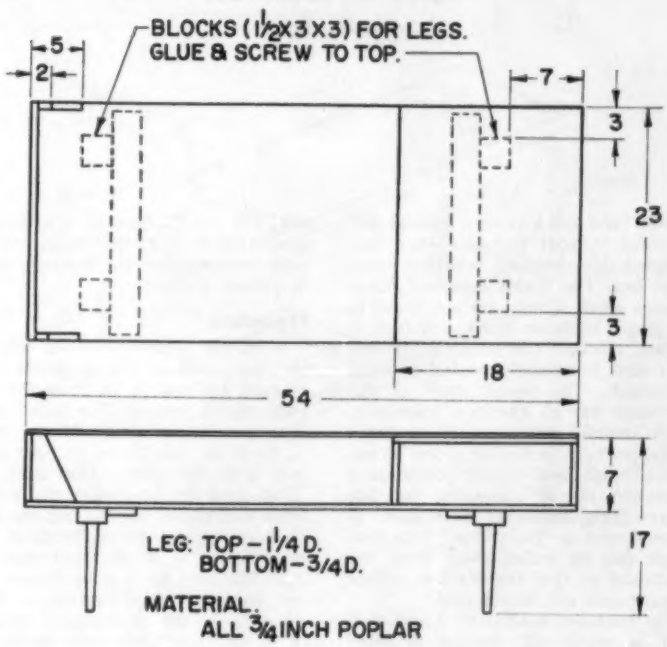


QUAN	MATERIAL	SIZE
1PC	SHT. METAL 22 GA.	3 1/2 X 22 1/4
1PC	" " "	17 1/4 X 1
1PC	" " "	2 3/4 X 7 1/2
1PC	" " "	1 X 2 1/2
1PC	EXPANDED METAL	8 X 3

CONTEMPORARY COFFEE TABLE

JOHN J. DeFOURNY
Dominion Junior High School
Columbus, Ohio

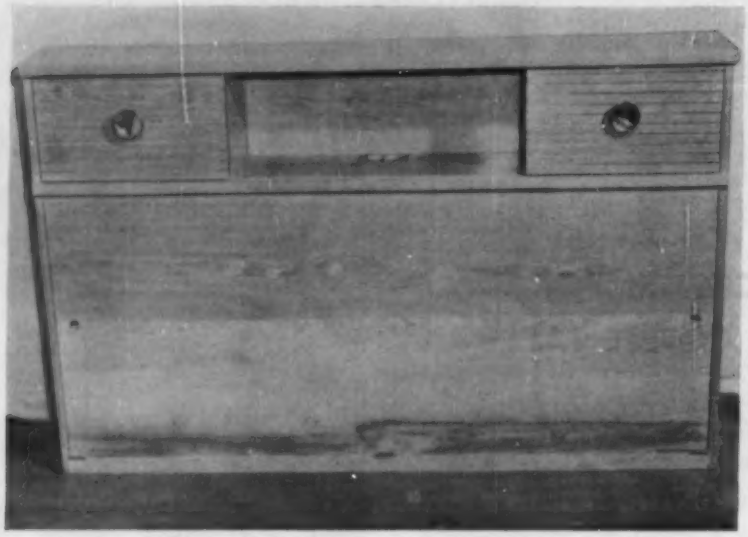




Here is a table that has been well received by students and the public. Combining the beauty of wood and glass, it seems to have the quality of design that brings immediate admiration from the observer. While it is not an especially simple project and may even be a challenge for an older student, such projects take students to the level of realization that he can carry a difficult and complicated assignment to success as will be required of him as a man earning a living in the world.

Its simplicity is obvious but at the time of its construction many problems had to be solved to produce this impression of simplicity. Overstrengthening the supports would have produced a bulky effect and violated a rule of "good design." Some individual tastes might like to have slightly larger diameters for the legs rather than the 1½ to ¾ measurements. By inserting the top of the leg into a 3-in. square block of wood and using glue and screws, the legs may be fastened to the bottom of the table. Also, the glass could be held on the table with smaller and less obvious attachments.

Poplar wood was used because of its attractive colors in the grain. A natural finish protected the beauty of the wood.



A MODERN BOOKCASE HEADBOARD BED

JOHN W. HAMPTON
Dallas, Tex.

Good taste and a modern outlook will be added to your bedroom when you construct this charming bookcase headboard bed. The design combines many features which usually are not found in any single bookcase headboard bed. A blanket storage compartment utilizes space that is normally wasted in most headboards. The center shelf of the headboard has an electrical receptacle, which permits the using of electrical appliances without having to use an extension cord. Two sliding panels do a decorative job of concealing the side shelves. This headboard is designed to be used with a "Hollywood" type bed, which can be pulled away from the headboard so that the blanket storage compartment will be accessible.

The bookcase headboard described is built of white oak, finished in limed oak. The construction of this bookcase headboard is easy and inexpensive. The time required for construction should be around 50 hours.

Procedure

1. On the underside of the top a ½ by ¾-in. dado is cut, to within ½ in. of each end and ¼ in. from the front edge, which serves as a panel guide. Also on the underside of the top a ¼ by ¾-in. dado is cut on each end to join with the sides. This dado ends ¼ in. from the front edge, and is ¼ in. from each end of the top. Sixteen inches from each end cut a ¼ by ¾-in. dado to within ¼ in. of the front edge.

2. The shelf has a ¾ by 9¾-in. notch cut from each end, leaving a ¼ by ¾-in. lip on the front edge of each end. A ⅛ by ½-in. dado front panel guide is cut ½ in. from the front edge of the top surface the full length of the shelf. A dado ¾ by ¾-in. is cut 15¼ in. from each end, ending one inch from the front edge. Cut an opening in the center at the back edge to enclose the electrical receptacle.

3. The sides have only two cuts each. Cut a ¼ by 1-in. dado 9¼ in. from the top end of the inside surface of each side. A hidden ¼ by ¾-in. dado is cut 1¼ in. from the bottom end of each side on the inside surface.

4. The baseboard has a ½ by ¾-in. rabbet cut the full length of the top back edge, which will support the bottom.

5. Rack supports are cut as shown in the door detail.

6. Each sliding panel is rabbeted ⅛ by ¼ in. on the lower front edge. The panel is placed in the cabinet by inserting it in the top dado, pushing it into the proper position, and letting it drop into the lower dado. Saw kerfs spaced ¾ in. apart supply the front design on the sliding panels.

Assembly Procedure

1. The cabinet is easily assembled at one time. Set parts out on a large surface in approximate assembled positions. Start by gluing the shelf to the sides and clamping. Next glue the bottom and baseboard to the sides. Stand the cabinet up and glue the shelf dividers to the shelf. The top is then glued onto the top of the shelf dividers and sides. The top should be clamped to the shelf.

2. The blanket rack and rack supports are screwed and glued to the door supports through the back of the supports. The door supports are then

attached to the door with wood screws. The door hardware is installed as shown in the door detail.

3. In order to simplify finishing, both backs and the door are left off until the finishing is completed.

Finishing Procedure

The bookcase headboard described has a limed oak finish, but it could have been finished many ways. If you prefer a limed oak finish the following steps will assure success.

1. Sand all surfaces to be finished with 6/0 sandpaper, making sure all scratches and chips are removed or feathered out.

2. Raise the grain at least two times to make sure all mars are removed.

3. Remove all sanding dust with an air hose and wipe the surfaces down with a clean soft cloth.

4. Apply as many coats of a good white filler as is necessary or desired to fill the grain smoothly and evenly.

5. After the wood filler has dried thoroughly, sand all surfaces very lightly with very fine steel wool, and again clean surfaces with an air hose and a soft clean cloth.

6. In order to be sure that the wood filler won't turn yellow, water white lacquer should be used for finishing.

7. Apply two or more coats of water white sanding sealer lacquer, rubbing to a smooth finish between each coat with fine steel wool.

8. Before applying the finishing lacquer, be sure the final coat of sanding sealer lacquer has thoroughly dried, and has been rubbed to a glass smooth finish with steel wool.

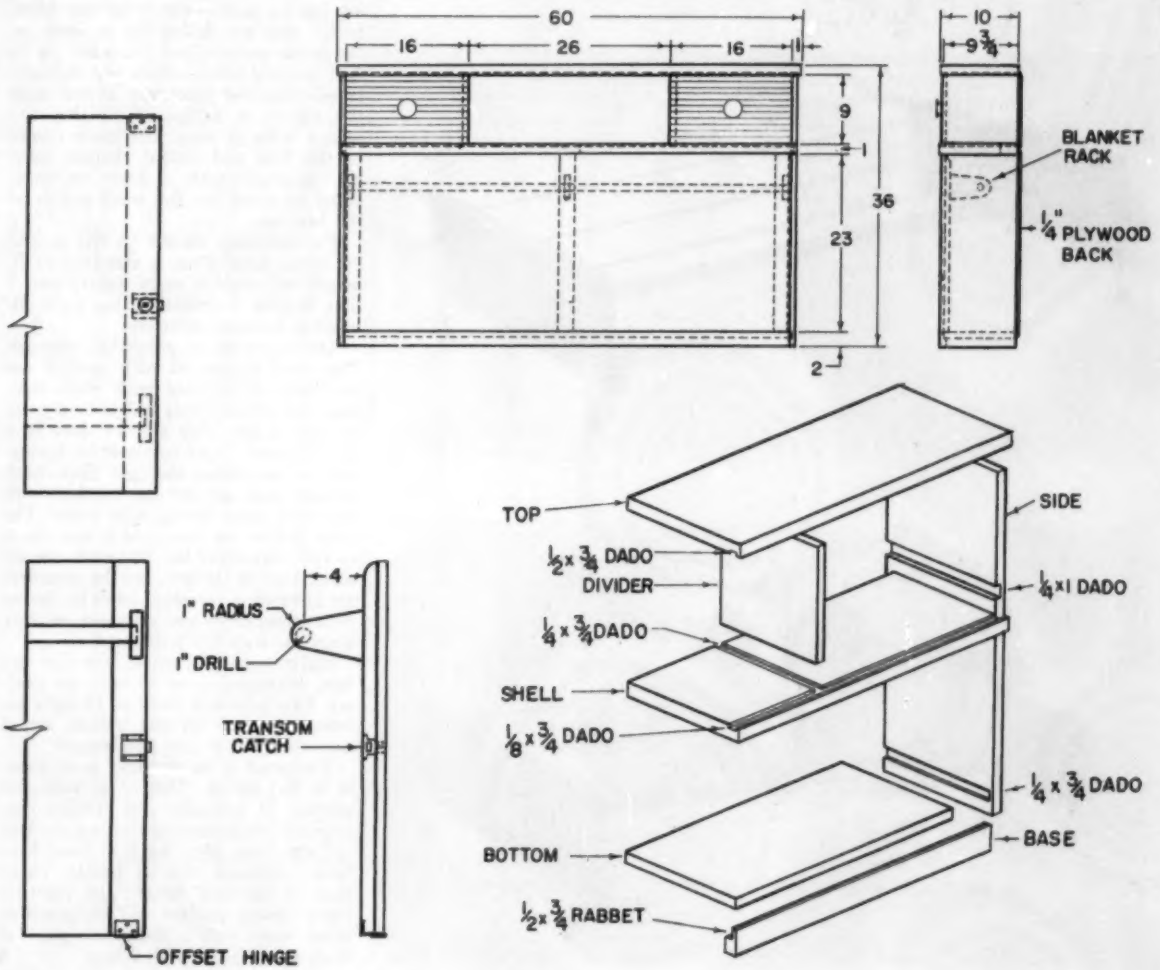
9. Apply four or more coats of water white finishing lacquer. The thinner, and more coats applied, the better the finished surface will be. Between each or every other coat of finishing lacquer, the surfaces should again be rubbed down with very fine steel wool and cleaned.

10. After the final coat has been applied, rub down the surface again with very fine steel wool. Rub the surface briskly with clean soft toweling or cheese-cloth. If you have been careful in the above steps, a mirrorlike surface will be obtained.

11. A good furniture wax or paste automobile wax will give the finish a lasting mirror likeness.

Bill of Materials

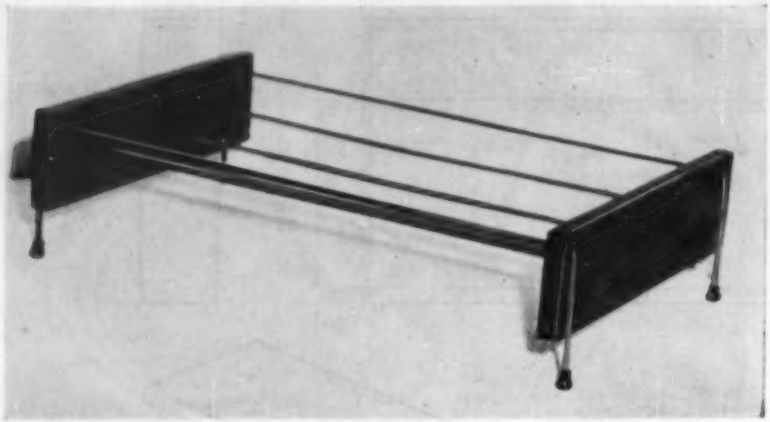
Quan.	Part	Material	Size
1	Top	White oak	1 x 10 x 60
1	Shelf	White oak	1 x 10 x 59½
2	Sliding panels	White oak	¾ x 9½ x 16
2	Shelf dividers	White oak	¾ x 9½ x 9
1	Shelf compartment back	White oak	½ x 9½ x 59½
2	Sides	White oak	¾ x 9¾ x 35¼
1	Front	White oak	½ x 23 x 58
1	Base	White oak	¾ x 2 x 58
1	Bottom	White ash	¾ x 9½ x 58½
3	Rack supports	White ash	¾ x 3 x 5
1	Rack	White ash	1 x 57¼
3	Door supports	White ash	¾ x 2 x 23
1	Back	Masonite	⅛ x 24 x 59
1	Electrical receptacle and cover plate		
1	8-ft. electrical cord and male plug		
2	2¼-in. diameter brass knobs		
3	1-in. offset hinges		
2	Transom catches and plates		

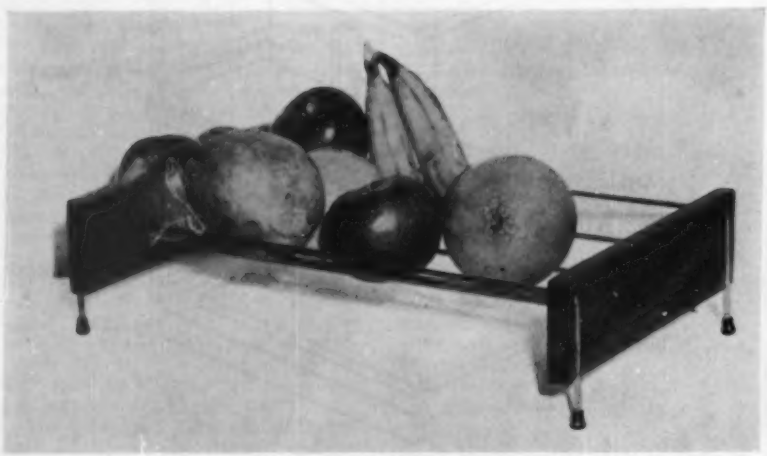


FRUIT BOWL — A GOOD MASS-PRODUCTION PROJECT

WALTER RUTHIZER
Croton-Harmon High School
Croton-On-Hudson, N. Y.

In earlier issues of this magazine, the problems of teaching mass production have been presented. (See your IA/VE for October, 1959, pp. 229–230.) To keep this educational experience vitally alive, it is essential that new projects evolve. It is a hope and almost a certainty that as more and more teachers become interested in this method, a greater variety of projects will result and find their way into classrooms. This article shows how an unusual fruit bowl — attractive and utilitarian at the same time — can be used to teach the art of mass production.





The project is simple in design — a rectangular form 9 by 14½ in. It relies upon properties of ⅛-in. square brass rod, i.e., the sharp bends that are made possible by the small size of the material, and the springback characteristic of this metal. Walnut wood was selected because of its color and the attractiveness of the brass and walnut combination. However, any other hardwood may be substituted if walnut is not available.

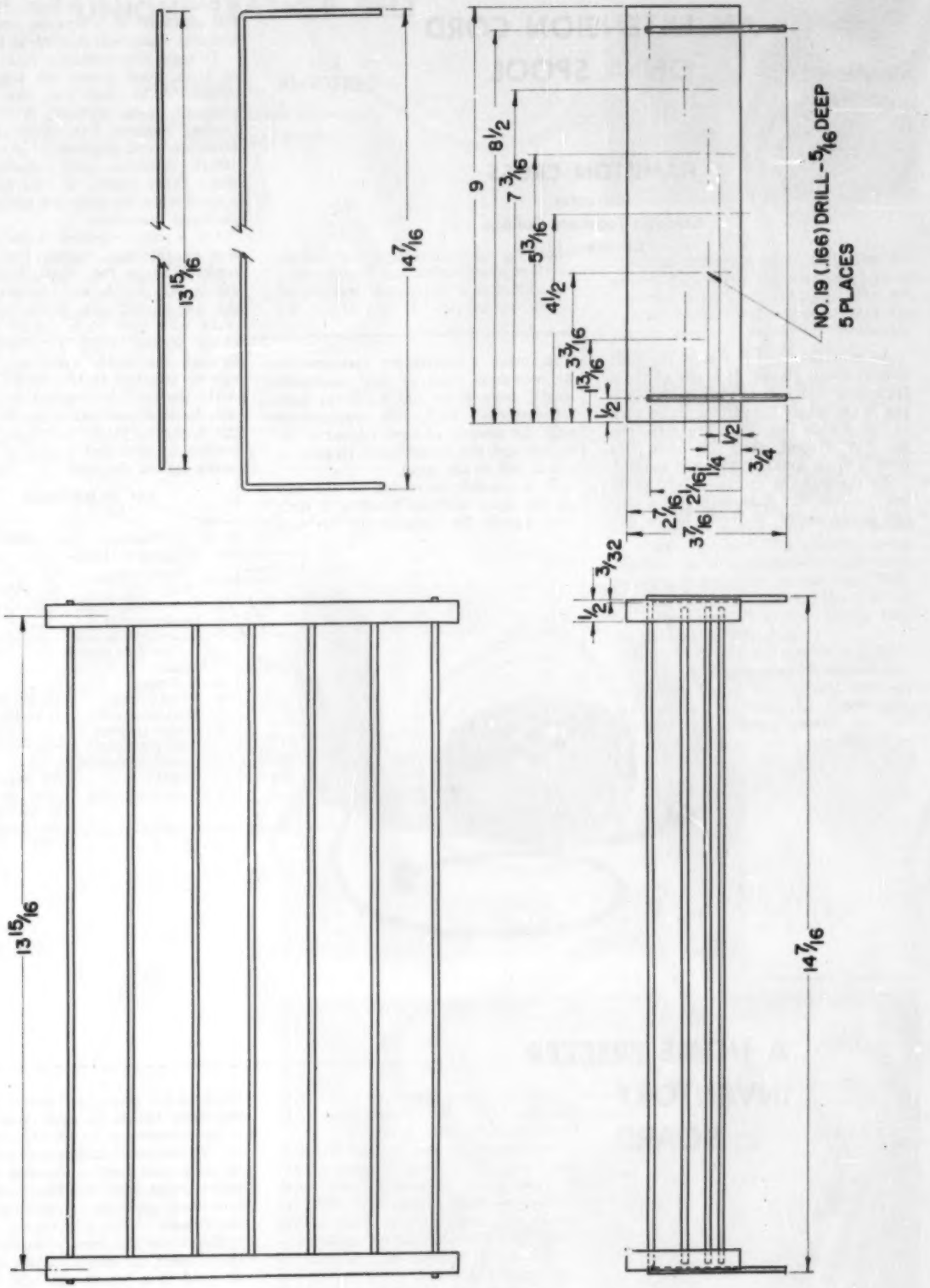
The construction is simple, and jigs are easily constructed due to the fruit bowl's linear design. Note that two drilling jigs are used — one is for the "blind holes" that are drilled $\frac{5}{16}$ in. deep on the inside surface, and the other jig to drill the end holes, which are through-holes. The end holes are routed with the aid of a fixture. Note that the groove is $\frac{3}{32}$ in. deep. The inside corner of the hole and routed channel must be "relieved" with a knife or small chisel to allow for the small radius of the bent leg.

The spreaders are cut 13 $\frac{15}{16}$ in. and 20 ⅛ in. long. Thus, a standard 12-ft. length will yield 6 short lengths and 3 long lengths. A simple cutting jig is advised to facilitate accuracy.

The assembly is somewhat unusual. The wood is sprayed with lacquer and the brass is polished with steel wool. One end of each long rod is bent 3 in. to form a leg. This may be done in a jig. (Do not forget to allow for springback when making the jig.) Then, both wooden ends are slid on together, with the blind holes facing each other. The other end of the brass rod is bent down to form the other leg. The ends are expanded out to the legs, and the spreaders are inserted in the blind holes by flexing the centers down and releasing pressure when the ends are positioned.

Using standard catalogs, the cost has been calculated to be 75 cents per project. This is broken down to 55 cents for brass, 15 cents for the walnut, and 5 cents for rubber feet and lacquer.

The proof of the pudding, so to speak, is in the eating. Thus it is with this project. It is easily and cheaply constructed by the mass production method. All who have seen the fruit bowl have been impressed with its beauty, cleanness of line and design, and practicability. Every student will be proud to bring home such a distinctive piece of work as evidence of his labors. ◀


13 15/16
14 7/16
9
8 1/2
7 3/16
5 13/16
4 1/2
3 3/16
1 13/16
1/2
NO. 19 (.166) DRILL - 5/16 DEEP
5 PLACES
3/4
1/4
1/2
2 1/16
2 7/16
3 7/16
1/2
3/32
13 15/16
14 7/16

AN EXTENSION CORD ON A SPOOL

HAMILTON CROSS
Instructor
Chicago Teachers College
Chicago, Ill.

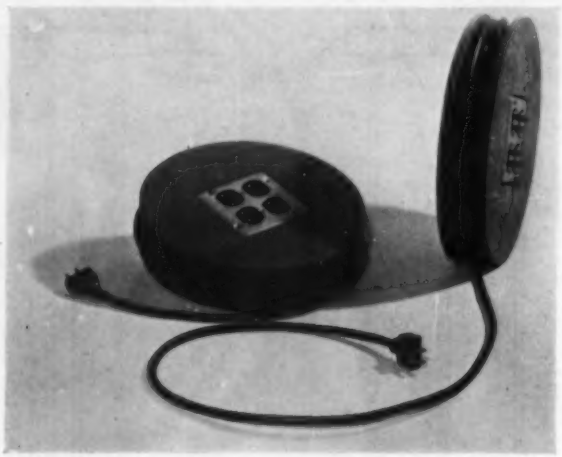
An extension cord is a must for most industrial-arts classes. It is one of those appliances which is needed in the shop and in the school for various duties such as the science fair, the Christmas tree, the P.A. system, etc. Too often this cord is dirty, knotted, and well tangled.

To alleviate the extension cord problem, two circular disks with duplex outlets in the center, as shown in the picture, make a convenient arrangement. An extension cord of any reasonable length, from 20 to 100 ft., works quite satisfactorily. With this arrangement only the amount of cord needed is unwound and the unused part remains in a neat roll on the spool.

It is possible to rewind all the wire on the spool without handling a dirty cord merely by stepping on the cord while reeling the rigidly held part on the spool. An extension cord wound on a spool of this type is easily stored on a shelf or hung on a hook. If wound and unwound in a straight manner no kinks or knots will develop in the cord.

To make this appliance, build a frame of ¾-in. wood around the 4-in. square electric outlet box. Cut two circular disks of ⅜-in. plywood. A 20-ft. extension requires 9-in. disks, a 50-ft. extension cord requires 12-in. disks, a 100-ft. extension cord requires 18-in. disks. Other lengths of cord will fit on a spool when the disks are made in proportional diameters.

Cut a square opening in one disk the size of the 4-in. square box. Attach both disks to the wood frame with 1½-in. No. 10 f.h. wood screws. Attach the 4-in. outlet box in the assembled disks with four ½-in. 10/24 f.h. machine screws. Drill a 5/16-in. hole through the wood frame so the cord can be attached to the duplex outlets. After the cord is attached to the outlets, fasten the outlets in the box, screw the cover in place, and complete the project by attaching a plug to the opposite end of the cord.



BILL OF MATERIALS

No. of Pieces	*Name*	*Size*
20"	Wood for the frame (hardwood preferred)	¾ x 1½ in.
1	Electric outlet box	4-in.
2	Duplex outlets	
1	Cover for 4-in. outlet box for 2 duplex outlets	
1	Male plug	
8	Wood screws	1½ in., No. 10 f.h.
4	Machine screws	½ in. 10–24 f.h.
1	Rubber covered, twin conductor cord (any desired length)	No. 16 or 18-ga.
2	Disks of plywood	⅜ in., diameter to be determined by the length of the cord

A HOME FREEZER INVENTORY BOARD

A home freezer inventory board is an industrial arts class project that combines simplicity with utility.

Any family owning a deep freeze is faced with the problem of keeping track of how many packages — and which kinds — of meat, vegetables, fruit, ice cream, etc., they have on hand at any time. The problem can be solved by woodworking students with a panel of perforated hardboard.

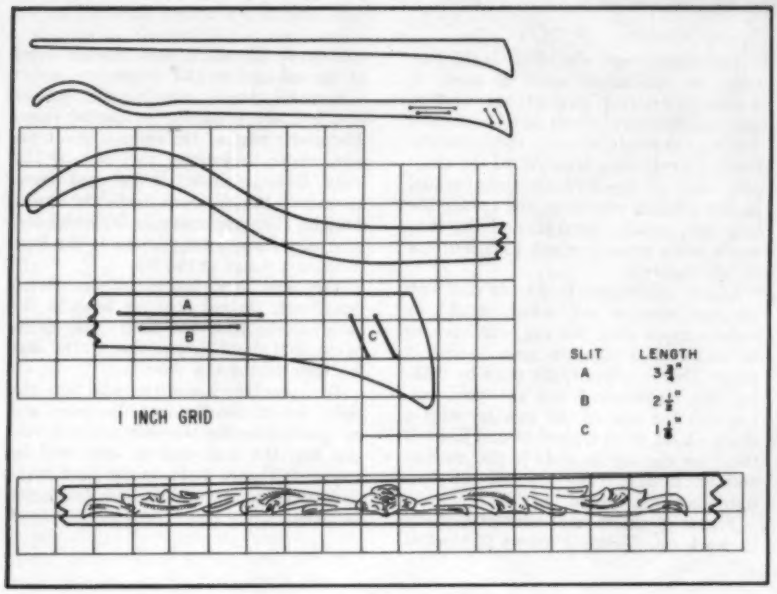
The inventory board is constructed by framing the back of the panel of perforated hardboard with ¾ by ¾-in. wood strips glued and nailed between the holes. Labels for each type of food in the freezer can be painted across the top of the board, or gummed labels can be used. Golf tees are inserted into the holes under each heading to indicate how many packages of each item are in the freezer.

Each time a package is removed from the freezer, a tee is pulled out and dropped in a jar or can held in place at a corner of the board with one of the removable fixtures available at hardware stores. Tees are put back on the board

UNIQUE LEATHER BELT

NORMAN C. PENDERED
Pennsylvania State University,
University Park

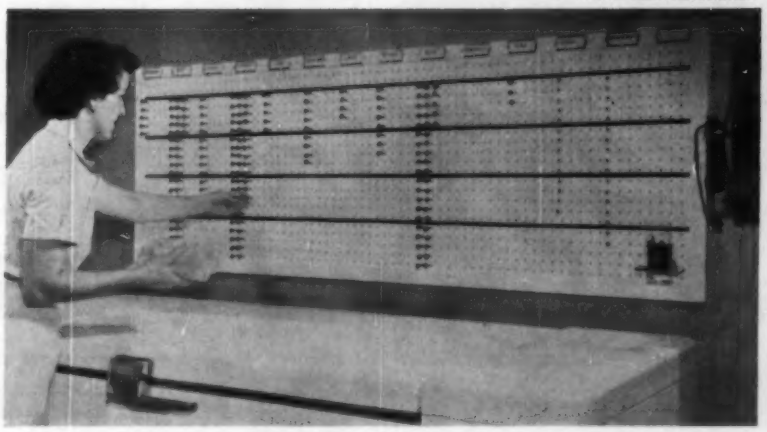
Here is a unique leather project with much student appeal because it makes a lovely gift for mother, sister, or girl friend. From a teacher's standpoint, the project is a good vehicle for presenting a number of leatherworking operations. In addition, the project is especially useful for it can be adapted to several levels of leatherworking skill. The beginner may leave the surface plain or decorate it with set stamping. The advanced worker will recognize that the project offers a variety of interesting possibilities for detailed carving.



The belt is simply a long, narrow, wedge-shaped piece cut from 6 to 8-oz. carving cowhide. It's a good idea to custom-fit the belt by making a full-size paper pattern first. Because the edges of a belt receive considerable wear, they should be burnished. This is accomplished by moistening the edges with water and a sponge and then rubbing them back and forth with the end of a modeling tool. The smaller end of the belt can be shaped easily while damp to the contour shown on the plan. Next, the holes are punched and the slits are cut. The holes, of course, are to keep the slits from extending.

If surface decoration is desired, carving or set stamping may be done to suit individual taste. The project may be dyed or left natural. In either case, however, a protective coating of clear leather lacquer or paste wax should be applied. ◀

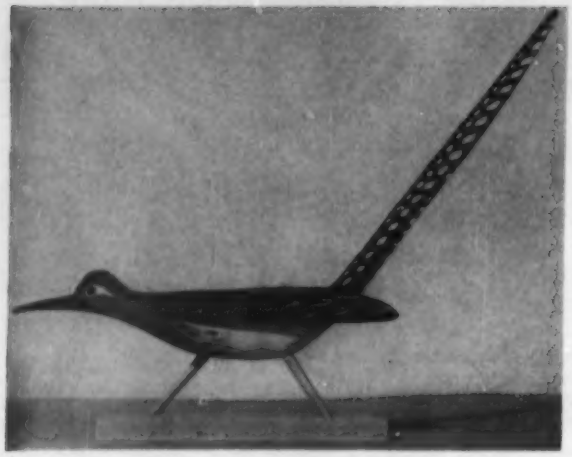
— Hardboard Association



when the freezer is stocked with fresh items.

The smooth-surfaced hardboard panel can be painted to harmonize with the color of the wall in the room at the student's home where the freezer is placed. A horizontal stripe of a different color painted between every five rows of perforations will help the counting of tees.

The inventory board can be nailed or screwed to the wall above the freezer at the student's home, or hung with picture wire. ◀



ROADRUNNER

BEN HUNT
Hales Corners, Wis.

The roadrunner, chaparral cock, Paisano, or whichever name is used, is a very interesting bird of our western and southwestern states and, once seen dodging through cactus and creosote bush, is never forgotten. All of the characteristics of the bird are incorporated in this stylized whittling; the crown, the long tail, usually upright, and the long stride when running which gave him one of his names.

Unless one wishes to whittle one with the tail straight out, which would be quite correct also, the tail will have to be made of a separate piece, glued in place. This is rather easily done by making two longitudinal saw cuts and cutting out the rest of the mortise with a sharp chisel. With a good fit and Elmer's Glue, set the tail in place in the mortise and let it dry. Then saw off the bottom, shown in dotted line "X."

Figure 1 shows the silhouette ready to work on. Figure 2 shows it blocked out. Note the slant cuts on the sides of the tail and on the wings.

In the top-view drawing, the outline of the body is shown in dotted lines. The under part of the wings are flat except where they leave the back of the body. This is shown in the end view. Note how the tail is shaped. The top is straight. The underside is hollowed out gradually from a flat surface at the base to quite a gouge at the tip.

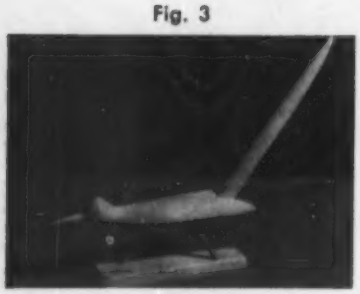
The legs are tapered ¼-in. birch dowel rod. Do not drill the holes in the body or the base too deep. Just about ¼ in. will do. The position of the legs is shown in the top view.

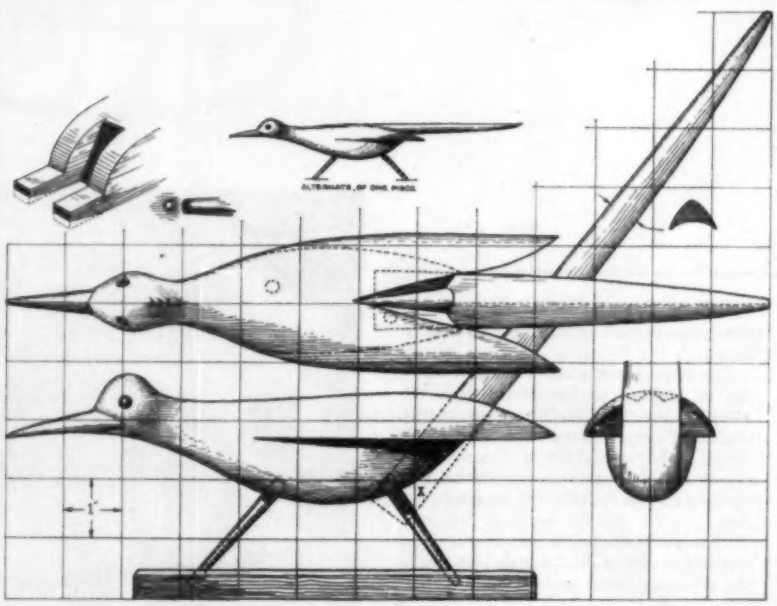
To assemble, insert the legs into the body, insert one leg into the base, and by gently forcing the other leg, it will slip into the base and no glue will be required. Figure 3 shows the bird whittled, sanded, assembled, and ready for painting.

Fig. 1

Fig. 2

Fig. 3





SPEECH MODULATOR

ISAAC P. HAMPTON
Industrial Education Department
University of Missouri, Columbia

A speech modulator capable of handling eight to ten watts of audio makes a useful adjunct to low-power ham radio transmitters (see your IA/VE for May, 1959, pp. 155–158).

This piece of equipment enables the holder of a General Class or Conditional Class amateur license to go on phone operation with a minimum of expense using the existing C. W. transmitter. The unit described below will effectively modulate a transmitter of up to 25 watts power input, and has been successfully used by the writer with several different transmitters. Power to operate this modulator may be obtained from the same supply as is used for the "rig."

Figure 1 shows a schematic diagram, and Figure 2 a pictorial illustration giving the general layout of parts. Location of components is not critical on the lower-frequency bands (40 and 75 meters). The mike-to-grid transformer is a government surplus item, available from several radio supply houses. The greatest item of expense is the modulation transformer, and even this may occasionally be found among surplus electronic gear on sale at a nominal figure. Other components can be obtained from salvage receivers, government surplus, or the radio junk box.

When S_1 is closed the high voltage B plus is shunted directly to the transmitter and the modulator is immobilized. The student is cautioned against C. W. operation of the transmitter with S_1 open. This allows surges of current through the modulation transformer secondary which may damage the winding.

Parts List

C_1 30 mfd 50 v. electrolytic
I_1 No. 47 pilot lamp
J_1 Open circuit phone jack
R_1 100 K ohm ½ watt composition resistor
R_2 270 ohm 2 watt composition resistor
R_3 220 ohm 2 watt composition resistor
S_1 DPST Toggle Switch
T_1 S.B. mike-to-grid transformer
T_2 Modulation transformer: 2500 ohm primary impedance, secondary to match R.F. amplifier tube.
V_1 Type 6 L 6 vacuum tube
RFC 2.5 m.h. Radio Frequency Choke

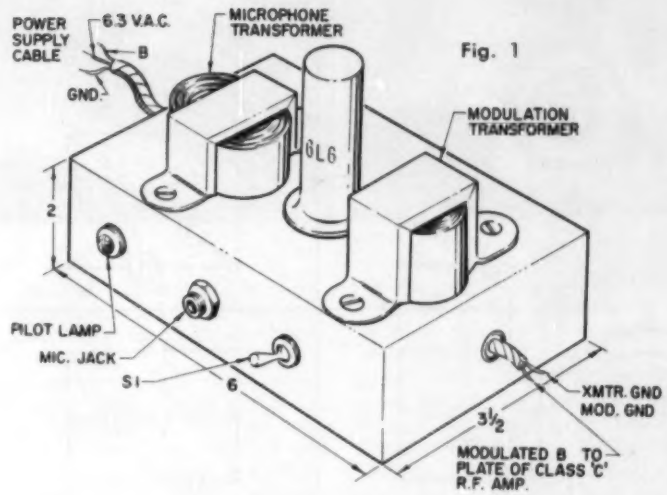


Fig. 1

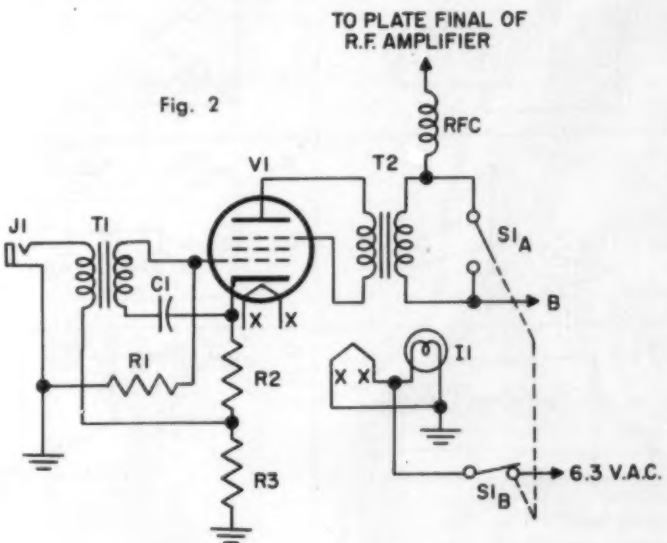
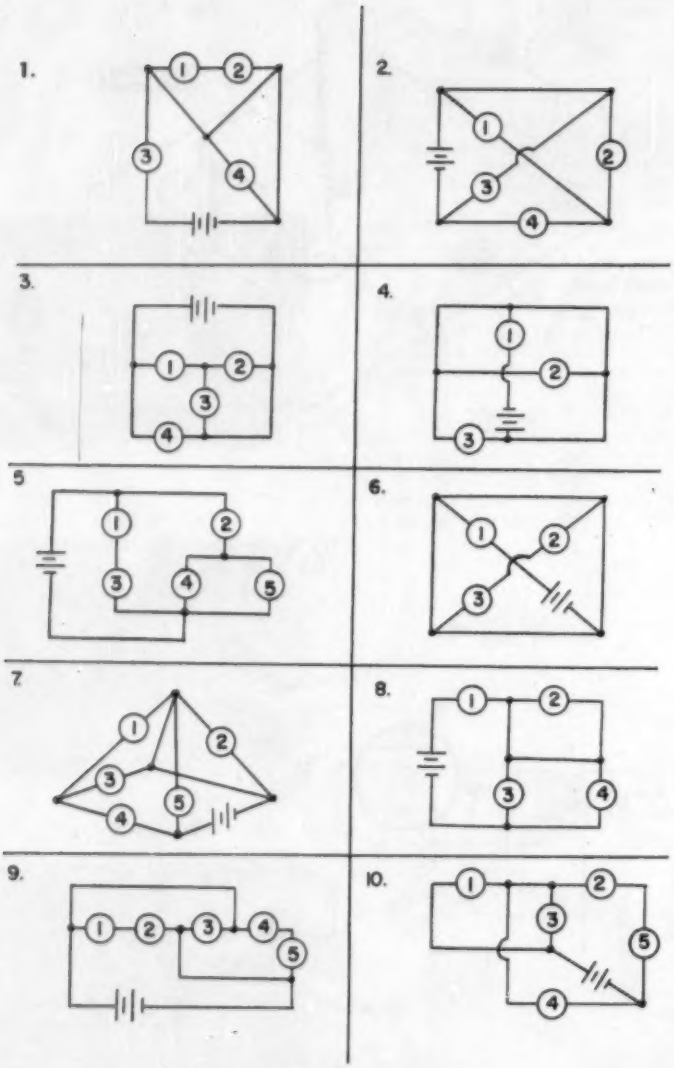


Fig. 2

A CIRCUIT COMPREHENSION TEST

ROBERT P. BALIN

Camelback High School, Phoenix, Ariz.



KEY TO CORRECT ANSWERS

Question 1, 3; Q 2, 3; Q 3, 4; Q 4, 1; Q 5, 2; Q 6, 1; Q 7, 5; Q 8, 1; Q 9, 3; Q 10, 5

In the introductory shop courses in many high schools here, only six to nine weeks can be spent in each of the various shops. This is not enough time to go very deeply into the theory of any shop subject. So we try, instead, to present a series of lectures, demonstrations, and laboratory experiments that will hold the freshman students' interest and, at the same time, give them an accurate picture of the content of the industrial arts courses that they may choose at the beginning of their second year.

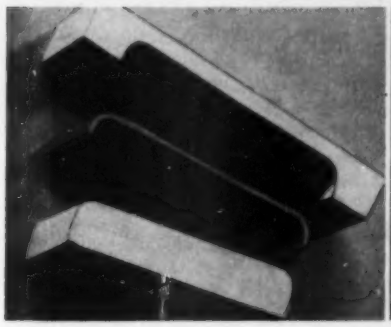
We do not wish to make the regular courses seem any easier, or more difficult, than they will actually be. This would attract the wrong students to these courses and defeat the purpose of the program. In the teaching of basic electricity and electronics this is especially true, and we would certainly convey a false impression of our course if we did not have electric circuits problems. But for most students, their lack of facility with algebra at this time discourages us from stressing even Ohm's law mathematically. We do, however, use it qualitatively in lamp problems both in our lectures and in our laboratory experiments.

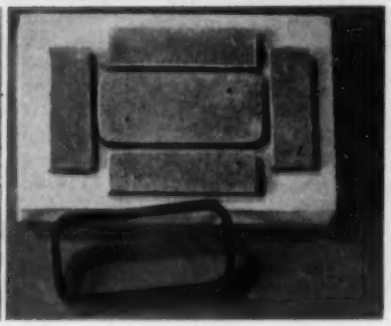
In the laboratory sessions the students set up experiments on breadboards using lamps, fuses, switches, and meters. Later, as a check on whether or not they really understand the distribution of voltage and current in series and parallel circuits, we give them this lamp circuit test. In these circuits the student need only to find which *one* bulb will light the brightest. All bulbs have the same voltage and wattage rating.

We found that the problems were something like a game to the students and many went back to the breadboards to prove out the solutions. Previous to the test, we trained them with similar problems, some of which were taken from this group but were presented to them upside down or sideways.

SALT AND PEPPER SET

BOB REEVES
Chico, Calif.





If you have been looking for a plastics project that is interesting to make, involves many different processes of construction, and requires a minimum amount of plastics — then try your class on the salt and pepper set shown here. In this one small project you will find the need for sawing, bending, sanding, buffing, cementing, drilling, and threading.

Start construction of the shaker by cutting the tubing to length and sanding the ends until they are square. Then cut the top disks to size and sand and buff the edges. Mark out the holes carefully and then drill them. Remove the protective paper and cement the tops to the tubing.

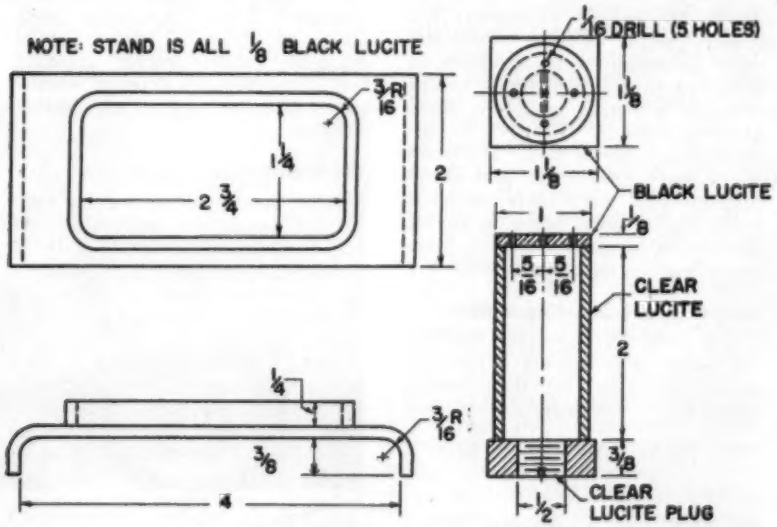
Construct the plugs for the base next by threading ½-in. rod with a ½ in. — 13 die. Thread enough for the two shakers at one time. Sand and buff the end of the rod before you cut a crosswise slot with a hack saw. This slot will later allow you to turn the plug in and out of the base. Cut the plug to length and sand and polish the newly cut surface. Now repeat the entire process for the second plug for the base.

The base of the shaker can be made of three layers of ⅛-in. plastic or a single thickness of ⅜ in. Cut the base pieces to size and sand the edges smooth. Next, locate the center and drill a $^{27}/_{64}$-in. hole in each piece. Now thread the holes with a ½ in. — 13 tapered tap. The tap, however, should not go all the way through. It should go just far enough to permit the plastic plug to completely enter the base, but not so far as to allow the plug to go all the way through. You will have to experiment a little to determine this distance.

Complete the assembly to the shaker by cementing the base pieces to the tube pieces. Remember that you can keep the cement from running down the sides of the tubing by applying the liquid to the bottom of the tubing rather than the top.

The stand involves a considerable amount of bending, for which wooden forms should be made. Cut the wooden pieces to the dimensions needed in the frame and sand the surfaces especially smooth. Better yet, where the plastic will touch the form, cover the surfaces with flannel.

The two pieces for the stand should be cut to size, and the edges should be sanded and polished. Remove the protective paper and heat the plastic in an oven of some sort. When the plastic is warm enough to be pliable place it in the forms and hold it until it cools. Remove the plastic from the forms and cement the two pieces together as a final step.



IA/VE
special / report

▶ the "why" and "how-to" of using the air-acetylene torch method of —

Copper Enameling in I-A Classes

PETER T. McKINNEY

The theme of this talk is the process of copper enameling. Not just the "how-to-do-it" of the process but also the "why-to-do-it." The reasons in favor of "why-to-do-it," that is, why to enamel copper in industrial-arts general metals programs, were extremely simple to find. Recently an article appeared in IA/VE under the heading, "Discernible Trends in Industrial Arts for the Past Half Century." (See your IA/VE for May, 1958, pp. 141 to 145.) The article by Marshall L. Schmitt of the U. S. Office of Education states, "broad areas of industry should be a part of our work instead of sampling a few specialized fields in handwork."

Here is an interesting sentence from the same source: "As the industrial arts concept replaced the manual-arts concept, there was a general decrease in the amount of work done with manual tools and an increase in the amount of work done with machines." This article also states: "Through the period of 1900–28, various individuals throughout the country began offering more and more opportunities for students to work in a variety of materials and to work in activities heretofore never dreamed possible." In 1947, an industrial-arts thinker said, "The trend is definitely toward the generalized program with much more emphasis being placed upon planning to include work in many materials, such as the various metals and alloys."

Why Copper Enameling in IA?

The 1953 AVA brochure entitled, "A Guide to Improving Instruction in Industrial Arts" lists the following areas for a comprehensive general shop: (1) Drawing and planning, (2) Woodworking, (3) Metalworking, (4) Electricity and radio, (5) Graphic arts, (6) Transportation and power, (7) Plastics, (8) Leatherwork, (9) Ceramics, (10) Textiles, and (11) Home mechanics.

Mr. McKinney is manager, public relations department of the Chicago office of Union Carbide Corp.

Let me touch only briefly on the objectives of industrial arts as related to copper enameling. The A.V.A. lists four objectives which in my opinion have a bearing:

"1. Interest in Industry. To develop in each pupil an active interest in industrial life and in the methods and problems of production and exchange." An enamelist in a small but practical way is applying enamel that is similar to that on kitchen sinks and the inside of water heating tanks.

"2. Appreciation and Use. To develop in each pupil the appreciation of good design and workmanship and the ability to select, care for, and use industrial products wisely." Dropping, striking, or otherwise mistreating a copper enameled piece will result in severe damage. There is a clear parallel here to mistreating a sink top by dropping on it a hammer or other heavy sharp object.

"3. Health and Safety. To develop in each pupil desirable attitudes and practices with respect to health and safety." The average boy will have occasion many times during his life to use an open flame. Copper enameling gives the industrial-arts teacher a splendid opportunity to inculcate extreme respect not only for the flame but for a compressed gas be it natural gas, propane, or acetylene.

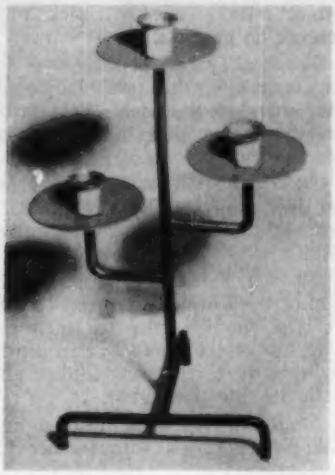
"4. Interest in Achievement. To develop in each pupil a feeling of pride in his ability to do useful things and to develop worthy leisure-time interests." This hits a great many facets of industrial arts. Copper enameling under teacher guidance and stimulation can develop "worthy leisure-time interest" as can leather working.

The Manipulative Skills

What about manipulative skills developed by copper enameling? As you think of manipulative skills in woodworking so may you for enameling. Here are a few: handling an acetylene tank, turning on cylinder valve, adjusting delivery pressure, opening a torch valve, and igniting the torch by a spark lighter (NEVER use a match), preparing copper piece, applying powder, placing piece on firing stand or in kiln, firing the piece, adding more powder or design and firing, cleaning edges and back, soldering fittings, etc.

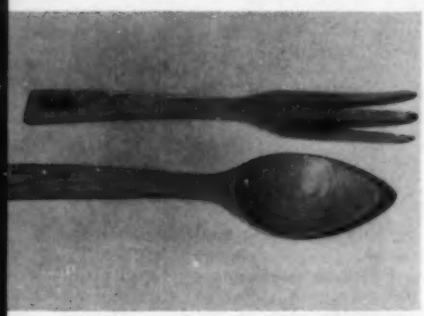
It hardly needs mention that students should prepare a plan of work

projects in the trend of i-a work in many materials

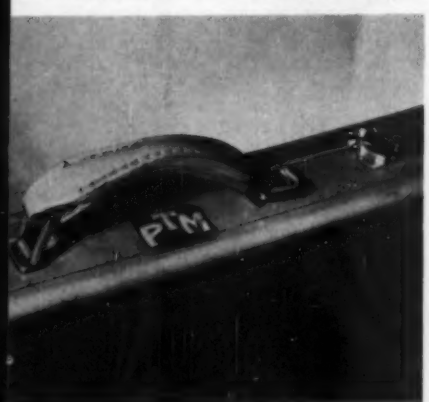


— Union Carbide Corp.

Oxy-acetylene welding is combined with copper enameling in this candelabra.



Plain wood salad bowl utensils are given new creative interest by applying enameled copper shapes.



Copper-enameled initials are applied to leather bag soldering a small bolt to the back of the copper piece.

as well as a sketch, *in color*, of the finished object. This is a phase of manipulative skill as well as the ability to plan.

Like many industrial arts subjects, copper enameling permits the teacher to impart scientific and industrial knowledge to students. Kilns are miniature heating furnaces — develop this. Acetylene, formula C_2H_2, is a universally used industrial gas. With air it burns at a flame temperature of 4070 deg. F. Copper's melting point is 1980 deg. F. and the enamel melts at 1450 deg. well below the melting point of copper. Make a point of why pure unalloyed copper must be used. Because alloys in copper have lower melting points the alloys will be overheated in the firing and residues of alloys will boil up through the enamel coating. Illustrate this by enameling a piece of alloyed copper.

Copper enameling as a unit in your school permits you to explain an acetylene cylinder and above all why acetylene should never be subjected to pressures over 15 lb. per sq. in. outside a cylinder. And for the budding chemists in your classes you can say that acetylene and chlorine are combined in chemical plants to make neoprene rubber.

Acetylene burning with pure oxygen in an oxy-acetylene blowpipe (emphasize this), produces a temperature of 6000 degrees F. Manipulative skills gained in air-acetylene applications transfer *directly* to the greater skill needed for oxy-acetylene welding, cutting, and other processes.

Vocational Uses of Copper Enameling

Manufacturing and service industries employ thousands and thousands of air-acetylene torches. Plumbing, sheet metal trades, utility and telephone trades, radio assembly, air-conditioning assembly, and repair — all these fields use this torch in many ways. A reasonable percentage of industrial-arts students may have occasion to use an air-acetylene or some other type of flame in their future employment.

Even more widely used in industry is the oxy-acetylene flame. Its use in secondary school industrial arts and vocational classes is on the increase. Your classroom use of the air-acetylene flame in copper enameling will doubtless help supplement future training and learning areas that some high school students enter.

A brief word about silver work as it relates to the air-acetylene flame. Skills gained in the use of the torch in copper enameling may be applied to silver jewelry work in high school classes. The air-acetylene flame is ideal for silver soldering. Obviously, it is possible and quite feasible to use the torch to enamel silver or combine silver and copper in a finished project.

Project Skills and Techniques

This brings us to a fascinating but relatively unexplored area of industrial arts — that is the use of different skills and techniques in one finished piece.

As an example, a candelabra is made from welding rod as a base (fusion welded by oxy-acetylene flame) and enameled copper trays and candle holders are done with the air-acetylene torch. It is obvious that enameled copper candle fittings could also be combined with parts of an assembly made from wood.

Here are a few other suggestions along this line of thinking. It is possible to combine copper enameling with leather work. My brief case has carried copper enameled (and soldered) initials made over three years ago. Copper enameling may be combined with work in plastics or aluminum.

But because woodworking is so widely practiced in industrial arts it would be more practical to consider adding copper enameled shapes to projects made of wood. How about applying enameled copper shapes to book ends, to lamp bases, to table tops, to cigarette or sewing boxes, or to salad bowl utensils? This application calls for the enameling and the soldering on the back of the piece short lengths of brass rod or a small brass wood screw. It is not so obvious that you can combine copper enameling with sewing or dressmaking but frequently buttons are made with the process. Enamel supply houses sell tiny findings to soft-solder on the backs of pieces so that the buttons may be sewn to a dress or coat or students could make their own loops to solder on the enameled pieces.

Safety Rules for Acetylene

There are probably some general metals teachers that have never used acetylene. The fine safety record held by the acetylene industry and by industries using acetylene is based on careful adherence to safe practices. If your school has classes which use acetylene by all means check with the teachers who have experience in this matter. A booklet "Precautions and Safe Practices" published by Linde Company may be obtained free. A thoughtful reading of it and a brief review of important safety points with the class would be valuable.

Any open flame will produce deep serious burns if it touches the skin. You have to stress safety in this respect just as you emphasize safety in operating many wood- or metal-working tools. The quick 4070 deg. F. heat of the air-acetylene flame makes the firing of copper a fast process. There is no warm-up time. The flame may be directed to a particular spot on the piece and thus you can apply more heat to a particular area. This is desirable. Students, using the flame to enamel, can see the process take place. This is a learning advantage. Finally, with respect to the torch, the flame volume is adjustable. This permits fine control by students who will be enameling parts of several sizes.

This may sound presumptive but it is my sincere belief that industrial arts and general metals classes need some fresh project material. Copper enameling, especially by the torch method, admirably fits the demands of this thinking. Why? Well it is not expensive, materials are readily available at educational discounts, the resultant projects are useful and attractive, and above all, as stated previously, the process fits the area of your teaching.

Outline for Institution

Here is a suggested outline for you to follow in instituting copper enameled projects in general metals.

Teacher. Prepare study material on simple principles of process. Include material on firing method to be followed: kiln or air-acetylene torch. Include safety features and warnings in the study material.

Students. Students study the above and take short written and oral examination.

Teacher. Prepare study material on step-by-step requirements of the process. Include list of available materials: i.e., copper shapes, colors and kinds of enamels, tools, and equipment.

Students. Students read this material and take short written test on knowledge. Verbal question and answer period.

Teacher. Prepare material for students on choice of methods for procedure and suggested ideas for design.

Students. Students cover this section and prepare drawing and brief outline of procedure they plan to follow.

Teacher. Teacher checks drawing and procedure for each student, discusses, makes changes if necessary and approves.

Students. Student proceeds with project but does not fire. Checks with teacher on progress.

Teacher. Teacher demonstrates firing technique with torch before all students. A few students light torch and fire pieces under observation of teacher and students.

Students. Students fire base coats on their projects. Check results with teacher before adding decorative details.

Teacher. Teacher demonstrates second or third firing of project. (Note: It is a good practice to teach the safe use of the flame by frequently lighting the torch, firing a piece and extinguishing the flame).

Students. Students add design and fire pieces. Check with teacher for quality.

Teacher. Teacher demonstrates or explains how to clean backs of en-

the "how-to" of copper enameling with an air-acetylene torch —

Copper enameling is a simple art that can be learned quickly and put in practice by elementary students. On the other hand, the art can be quite advanced and, therefore, suitable for pupils at high school level as well as adults attending craft and hobby courses.

Until recently most copper enameling was done with an electric kiln, but many arts and crafts instructors have found that using an air-acetylene torch has many advantages over the kiln. Among these advantages are: fast firing, no warm-up time as with a kiln, visible firing, easier control of heat and ability to swirl without loss of heat. Another favorable factor is that oxyacetylene blowpipes and air-acetylene torches are already found in many schools, thus saving the expense of new equipment. Many schools have worked out arrangements where arts and crafts instructors share equipment originally purchased for vocational shops. In this way, the school is spared the expense of additional equipment or kilns.

Literature on copper enameling will show the teacher and craftsman, skilled and unskilled, what steps to take to produce interesting creative pieces. There is, however, little if any mention of the use of an air-acetylene torch as the method for heating.

In using the air-acetylene torch you can follow the same preparation and firing instructions as that based on kiln firing. All instructions are the same for torch firing as for kiln firing with the exception that the torch technique does not permit enameling on both sides.

Steps in Enameling

Cleaning

The first step to take is to clean the copper part on the side to be enameled. You can use fine emery cloth, steel wool, or abrasive erasers sold especially for copper cleaning. Fluid cleaners which when brushed on clean the copper and hold the powder in place may also be used. Many enamelers use a solution of nitric acid (one part) and water (five parts) to clean copper. With younger students it would be best to use the mechanical cleaning methods first mentioned.

Following cleaning, use a small brush to apply a thin coat of enameling oil around the edges of the piece. This oil helps keep the enameling powder out to the edge during handling and firing.

Sifting

Now you are ready to use the mesh sifter to apply the dry enamel powder by the simple sifting method. It is a good idea to use sections of slick magazine pages to collect enamel powder that does not stay on the piece. After you have completed the sifting carefully move the part off the paper with a putty knife or spatula and use the paper to return the excess enamel to the bottle. Hold the sifter over the part and tap it gently so that you get a level coating of enamel on the part. Cover edges first and work toward the middle. The thickness of the enamel on sifting should be about 1/32 in. Another way to estimate how much enamel is needed is to cover the piece so that the copper can barely be seen, and then uniformly sift on a little more over the entire piece so that the copper is not visible.

Firing

When the copper is evenly covered

ameled parts preparatory to soldering on fittings (findings).

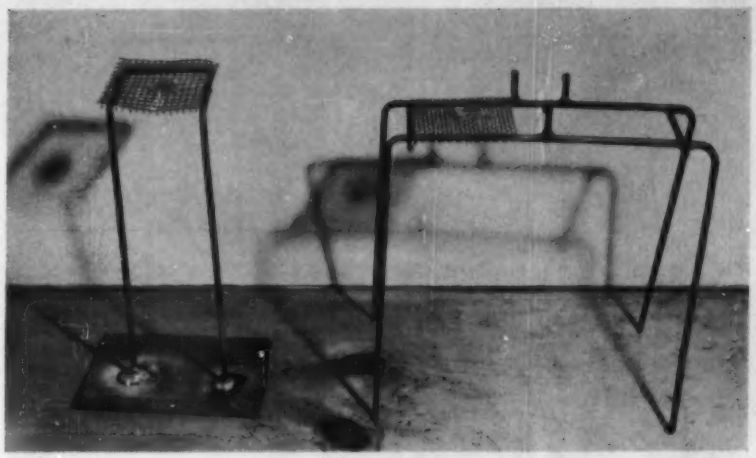
Students. Students clean enameled pieces and check with teacher.

Teacher. Teacher demonstrates soldering different types of findings to backs of pieces. (Fittings for cuff links, earrings, pins, or buttons).

Students. Students solder on fittings and perform final clean-up of back and edges.

Firing Stands

Before firing up a torch to show some simple steps in copper enameling your attention should be called to the firing stands. These are not made commercially but they are extremely simple to produce in a welding shop. The metal rod is ¼-in. oxyacetylene welding rod. The joints in the larger stand are fusion welded. Legs are about 12 to 14 in. This gives plenty of room to get the torch and flame under the pieces to be fired. The horizontal rods at the top of the stands should be spaced to accommodate the Niacrome mesh squares on which copper pieces rest while being fired. The prongs on the larger stand are used to hold larger ash trays for firing. ◀



Firing stands, so necessary to efficient copper enameling with air-acetylene torches, are simple to make. Use ¼-in. diameter welding rod which comes in 36-in. lengths.

with enamel powder, carefully place the part on the Nicrome screen on the firing stand. Turn the acetylene valve to start the gas flow through the Prest-O-Lite torch and light the gas using a friction spark lighter. *Do not use a match* as the hot 3800-deg. flame emerges with considerable force. Always remember to use acetylene in this tip at from 5- to 8-lb. pressure. If you don't use a regulator that shows pressure then be sure the acetylene is flowing at a high rate. This precaution is given because at low delivery pressures the acetylene will burn within the tip and quickly ruin it. This precaution does not apply to other air-acetylene tips and you may use lower pressures of acetylene when operating them.

Firing is easy with the air-acetylene torch. After a short amount of practice on test pieces you will be expert in judging how much heat to apply. If you examine the air-acetylene flame of a multiflame tip you will see that quite near the orifices there are short cones of flames. Beyond these cones is a large bushy outer flame. When you first apply the flame to the copper, position the torch so that the short cones in the flame are about ½ in. from the lower side of the part. This will heat the copper rapidly and as the copper starts to turn dull red move the flame lower so that the bushy outer part does the final heating. The copper blank will turn from dull to a brighter red and then you will see the enamel powder slowly melt and become liquid. Play the flame around in a small circle and alternately move the flame closer and farther from the piece. When the surface of the enamel is completely liquid and has a smooth homogeneous surface, remove and extinguish the flame. Let the copper blank cool on the stand until you can handle it without burning your fingers. Do not test heat by touching with a finger. Instead, place back of your hand *near* the part and if it seems cool then test with the finger.

Here is a hint on firing irregular copper parts such as a seahorse shape. The long thin tail section of the part will get to desired temperature more quickly than the body. So direct the flame more at the body than the tail. By so doing you will avoid overheating the narrower section of the part. Follow this advice in all irregular shapes.

Finally, the following materials are required for copper enameling:

Air-acetylene torch

4 torch tips to fit blowpipe. Recommended: No. 1, No. 3, and No. 6

Acetylene hose between torch and acetylene regulator

Acetylene regulator

Cylinder of acetylene (Size *B* tank or larger)

Friction spark lighter

Steel wool

Files

Putty knife or spatula

Tweezers

Camel hair brushes

Emery cloth

Rosin-core solder — small diameter

Free burning oil, gum tragacanth, or agar solution

Nitric acid or other chemical cleaning fluid

Sifter (80 mesh)

Assorted enamel powders — opaque and transparent

Enamel lumps, assorted

Enamel threads, assorted

Nicrome screen

Swirling tool (1/16-in. stainless steel rod with sharp point)

Firing stand (shop made)

Pure copper blanks for jewelry, ash trays, etc. ◀

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MODERN TEACHER TRAINING

(Concluded from page 256)

The industry study will involve group or class projects in the laboratory. Such projects will be as comprehensive and as representative of the industry studied as facilities will allow. In addition to the group projects, individual experiments may be required.

The last industry study taken by each student should be an individual study or research. The industry or phase of industry studied must be tentatively approved by the instructor under whom the study is made before registration. The student will be required to supplement the research with plans which could be used in the laboratory to help the study (group projects and/or individual experiments).

2. *Industrial Arts Practicum* (4 hours a week). Study of instructional procedures and materials, and curriculum planning for industrial arts is made. Observations of actual teaching situations will be discussed in seminars.

3. *Responsible Teaching* (Full time in selected schools). Each student in the college must satisfactorily complete a period of internship under the direction of his department in co-operation with selected master teachers.

The first three weeks of the semester are spent at the college with occasional field trips for observation. A half day will be spent in a seminar in which problems of industrial arts teaching are discussed. The remainder of the day is spent on individual development under the guidance of the instructor and the master teacher. The last two weeks of the semester are spent similarly evaluating the group's intervening teaching experience. Personal evaluation is an integral part of the post internship sessions.

4. *Time and Motion Study* (3 periods a week). This and the following two courses are not required for graduation, but may be taken by juniors or seniors in industrial arts as electives with departmental approval. Working procedures to determine the best methods and the best human motions are studied. Much attention is given to the establishment of time standards and method analysis.

5. *Industrial Management* (3 periods a week). The relationships between business administrators, between administrators and employees, and between administrators and the staff personnel, the place and function of the personnel administrator, and personnel administration and unions are studied. Labor mobility, employee morale, and the process of complaints and grievances are given particular attention.

6. *Philosophy of Industrial Arts Education* (3 periods a week). A critical examination is made of current theories of education and their relationships to our modern technological society. Practical classroom applications of theory are studied.

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Degrees and Awards . . .

● Three National Science Foundation research grants have been received recently by members of the faculty at Illinois Institute of Technology.

Dr. Franklin Essenburg of the mechanics department, was awarded a grant of $15,700 to subsidize studies entitled, "Thermal Stresses in Plates and Shells."

Dr. William F. Danforth, biology department, received a $1000 stipend for work in "Cellular Permeability and Metabolic Regulation in Unicellular Organisms."

Dr. Myron L. Bender, chemistry department, received $33,000 in support of work entitled "Mechanisms of the Hydrolytic Reactions of Carboxylic Acid Derivations."

Appointments . . .

● *Vernon W. Hoeche* is to be an assistant professor of industrial technology in the Department of Industrial Engineering at Purdue University, Lafayette, Ind. He will teach electronic courses for industrial education students. Mr. Hoeche received his B.Ed. degree from Illinois State Normal University; his M.Ed. degree from the University of Illinois, and has taken additional work at the University of Wisconsin.

He has had extensive experience in the field of vocational-industrial electricity and electronics. Mr. Hoeche formerly taught at Community High School, Wood River, Ill.; Naval Officer Candidate School, and was the Commanding Officer of the Naval Reserve Electronics Division at Alton, Ill.

● *Winston H. Carrington* has joined the faculty at Arizona State College as instructor in industrial education. He received a B.S. from Virginia Polytechnic Institute and the M.S. from the University of Alabama. During World War II he was a civil engineer at Oak Ridge, Tenn., and since has worked with several large consulting engineer firms and with the Pennsylvania Turnpike Commission. He is a registered professional engineer and will teach certain courses for pre-engineers and industrial education majors.

● *Dr. Leo M. Ensman* has been appointed an associate professor of industrial education at Arizona State College, Flagstaff. Dr. Ensman comes to ASC from Kansas State Teachers College, Pittsburg, Kans., where he had been for ten years, teaching classes in woodworking, maintenance, and professional courses.

Dr. Ensman did his undergraduate work at Kansas State Teachers College and received his Master's degree from the same institution. He obtained the Ed.D. from the University of Missouri.

● *Guy B. Hughes* will teach textiles at the State University College of Education at Buffalo, during the 1959–60 school year, while Don Bujnowski is on leave finishing requirements for a degree.

Mr. Hughes attended the School of the Museum of Fine Arts in Boston and is a graduate of the School for American Craftsmen at the Rochester Institute of Technology where he majored in textiles. He has taught numerous courses for children and adults in silk-screen printing, ceramics, and general craftwork. He has conducted his own silk-screen printed fabric business in Dorset, Vt., for several years.

● *Orin Robinson* has been employed to supply for Mr. George Brown in the Industrial Education Department at Southwest Missouri State College at Springfield. Mr. Brown is on leave completing his residence work toward a doctorate degree at the University of Missouri.

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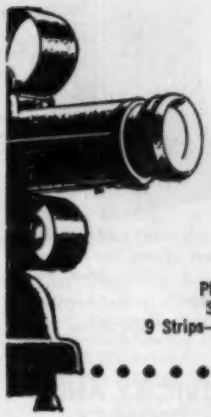

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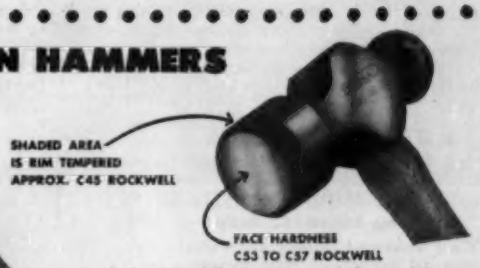

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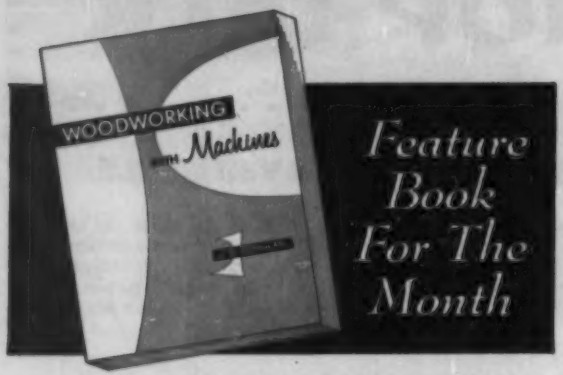

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Practical Shop Mathematics — Vol. I — Elementary

By John H. Wolfe and Everett R. Phelps. Cloth, 402 pp., 5½ by 8¼ in., illus., $4.50. McGraw-Hill Book Co., Inc., New York, N. Y.

This book is a direct outcome of classroom and shop experience. For several years Mr. Wolfe taught a course in shop mathematics at the Ford Apprentice School of the Ford Motor Company. To provide content for this course, he developed a set of loose-leaf printed lesson sheets. To gain the benefits of his classroom experience, he revised the sheets periodically and then tested the revised lessons with his classes. The material in this book and its companion, Volume II, is the outgrowth of these classroom tested lessons.

The subject matter is given under the headings: common fractions; checking multiplication and division by the excess of nines; decimals; micrometers, verniers, and bevel protractors; algebra; gear ratios and lead screws; plain and differential indexing; the slide rule; geometry; and trigonometry.

Tables of trigonometric functions are included; also the Greek alphabet, useful formulas for ready reference, answers to problems, and an index.

Printing: Careers and Opportunities for You

By Philip Pollack. Paper cover, 136 pp., 5¼ by 8 in., $2.50. Chilton Co., Chestnut and 56th Sts., Philadelphia, Pa.

Beginning with the first chapter on the history and the importance of printing, the author discusses the printing industry today, qualifications and training, your career as a compositor, as a composing machine operator, as a photoengraver, in lithography, as an electrotype or stereotype platemaker, as a pressman, in the bindery, as a typographic layout man, and then takes up the question: should you go into business for yourself. An appendix has been included.

Instrument and Control Engineering

By Lloyd Slater. Paper, 46 pp., 6⅛ by 9⅛ in., illus., Vocational and Professional Monograph No. 97. Bellman Publishing Co., Cambridge, Mass.

The author covers the subject in 12 chapters on the topics: instrumentation — what is it; history — how did it come about; status today — how important is it; field structure — where can I work in it; duties in the field — what will I do; preparing for a career — where and what to study; employment opportunities — how good are jobs; future opportunities — how will the field grow; technical societies and organizations; technical and trade publications; bibliography of selected books and texts in instrumentation; and career material.

Modern Wrought Iron Furniture

By Ned Frisbie. Cloth, 91 pp., $2.80. The Bruce Publishing Co., Milwaukee 1, Wis.

This book provides specific data for making a great variety of wrought iron furniture, using mild steel, expanded metal, angle iron, and wood. The designs are entirely practical and modern and each project has been used repeatedly in school shops.

Basics of Missile Guidance and Space Techniques

By Marvin Hobbs. Two volumes — Catalog No. 229-1 and 229-2; 229-H (two volumes in single cloth binding). Paper covered volumes, 304 pp. total, 6 by 9 in., illus., individual volumes $3.90 each; two volumes in single cloth binding $9. John F. Rider Publisher, Inc., New York, N. Y.

This two-volume course does an excellent job of making understandable the fundamentals of the important areas of electronics that will contribute to the conquest of space. The books are divided into broad parts.

Volume I covers the principles of control and guidance. Extensive coverage is given to radio and radar command links, guide beams, Doppler and homing methods, fundamentals of gyroscopics, inertial guidance and celestial navigation, computer applications, and actuators, as well as their related components.

In the second volume telemetering, space exploration by optics and electronics, satellite theory and practice, satellite monitoring and tracking as well as applications of earth satellites are covered. Navigation in space along with components and power sources for space applications conclude the volume.

Reference and Audio-Visual Materials on Iron and Steel

Second Revision. Paper, 66 pp. American Iron & Steel Institute, 150 E. 42nd Street, New York, N. Y.

A carefully annotated list of teaching materials available free or at nominal cost from the producers of steel and iron products.

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Different. Triple, cogged, V-belt outboard drive—eliminates intermediate shafts—delivers more power to spindle.

This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

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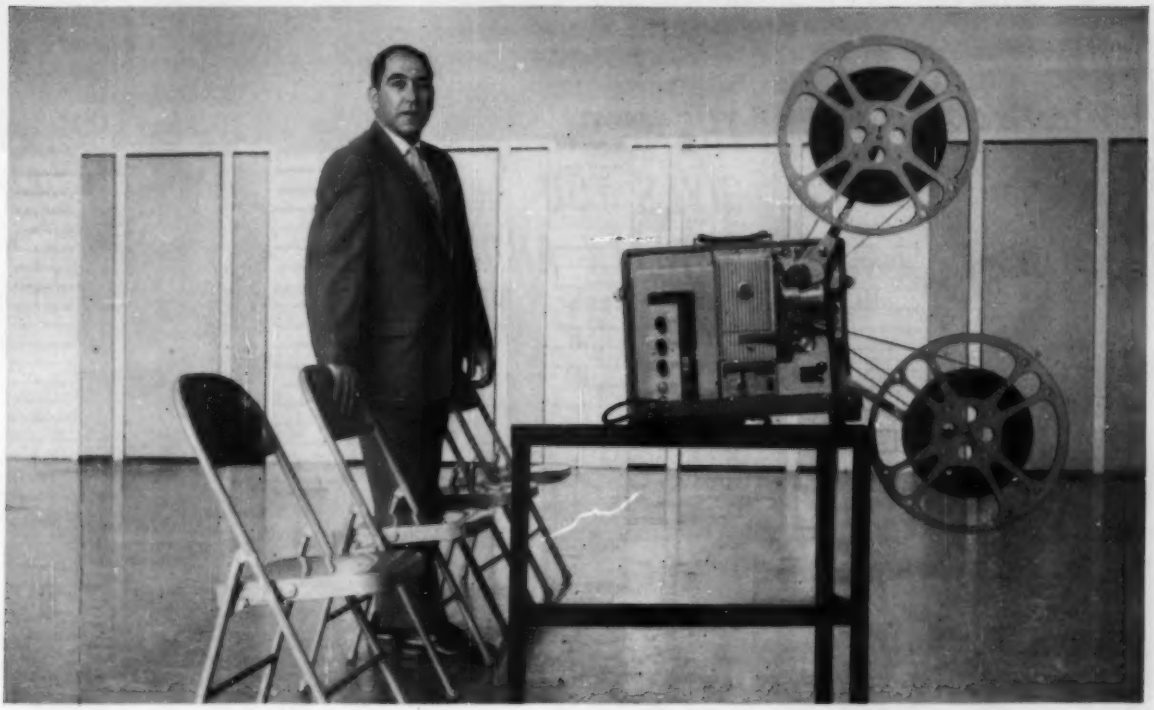
At the new Orchard Hill Elementary School, Leetonia, Ohio, selected by A.A.S.A. for its exhibit of outstanding school designs, George Trombitas, Assistant Principal, says:



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(For more information from advertisers, use the postcard on page 43A)

shop equipment / news of products for your school shop

COMPLETELY NEW RADIAL ARM SAW

Yuba Power Products, Inc., a subsidiary of Yuba Consolidated Industries, Inc., are introducing the Sawsmith — their completely new radial arm saw with five exclusive features. It is the newest addition to the Smith family of power tools. Yuba also makes the ShopSmith multi-purpose woodworking tool.

Sawsmith offers the following advantages: out-front controls allow instant, simple, one-handed operation — just loosen, locate, and lock; vari-speed selective drive gives a range of 7 speeds, providing the correct r.p.m. for any desired job; sliding, solid, one-piece table with fixed fence eliminates fence changing; automatic coil cord prevents cord damage; unique either-end arbor permits the use of blades on left or right side and therefore allows full-table capacity for all miter cuts.

New Radial Arm Saw

(For further details encircle index code 0901)

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8" JOINTER

* Shear-cutting feature . . . provides extra-smooth finish
* 64" long table
* Head completely guarded when rabbeting
* Safety engineered rear table adjustment

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Circular Saws • Band Saws • Jointers • Shapers • Disc Sanders
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Y — A NEW 14-IN. LATHE

Yates-American Machine Company now offers a new 14-in. lathe, the J-214. The J-214 provides a 14-in. swing over the bed and a full 38 in. between centers. This machine has one precision "V" way and one flat way for positive alignment of head and tailstock.

Yates-American 14-in. Lathe

All adjustments are made without wrenches. Both head and tailstock spindles are machined for No. 2 Morse taper centers and adaptors. Lubricated-for-life bearings mount the spindle in the head casting and resist radial and thrust loads. A 4-step headstock indexing pulley is provided with a convenient indexing device for changing spindle speeds.

For more details write to Power Tool Division, Yates-American Machine Company.

(For further details encircle index code 0902)

(Continued on page 28A)

What's NEW at B-G

Many times at Conventions people ask us "What's New?". Generally they are referring to New Products that we are offering to schools. But here for a change we're showing you some of the time savers and expediters that are new in our great Cleveland plant . . . new and modern equipment added to help us better serve schools everywhere . . . to make our operation more highly efficient . . . to help us give our customers the service they're entitled to . . . and the lower cost possible through better methods.

Above (from 1 to 5) we show our new Stanley Strapping Machine and specially designed conveyor system in a close up and over-all operation. Then one of our modern lift trucks that carry these huge bundles of B-G Soft Textured Lumber to truck-tractors that are always at the loading dock, where it is quickly loaded in and on its way to another school "somewhere in America".

If you haven't yet received our new 1959 catalog — write today for your copy.

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Lumber, Industrial Arts, Vocational Education Machinery and Equipment

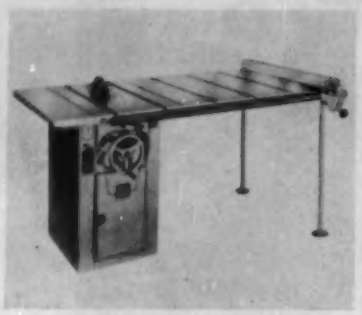
SHOP EQUIPMENT NEWS

(Continued from page 26A)

BOICE-CRANE MONOMASTER TILT ARBOR SAW

Much easier ripping of the largest plywood panels and cutting from the longest strip moldings and boards are made possible by new stamped steel table extensions for the Boice-Crane Monomaster 10-inch Tilt Arbor Saw.

When the maximum of three are used the table is extended to a width up to 67½ in. One or two extensions only, each 10½ in. wide, can be utilized to tailor a table to suit average needs of each customer. Adjustable outer leg supports are available and recommended when two or three extensions are used.



Monomaster 10-in. Tilt Arbor Saw

The extensions may be installed on present and past model Monomaster Saw Tables. They easily attach to Boice-Crane's extended ripping gauge bars which increase the clearance to 49 in. maximum between the blade and the ripping gauge, from a standard equipment maximum of 37 in.

Literature and prices available.

(For further details encircle index code 0903)

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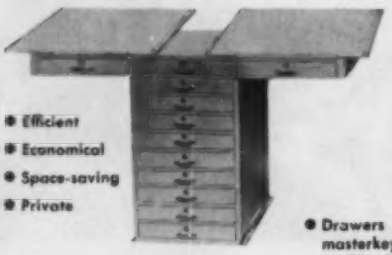

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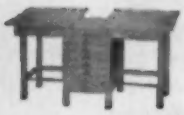
provides open working surface and horizontal board storage facilities for 12 students

- Drawers have individual locks, masterkeyed . . . hold boards up to 20 x 26 in horizontal position plus tools, other material.



for 10 students the DU-1000

for 9 students the DU-900

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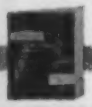
for 6 students the DU-600

8-drawer cabinet unit the DU-800

5 drawer cabinet unit the DU-500

Dual boards and drawer space for 12 the DU-1200



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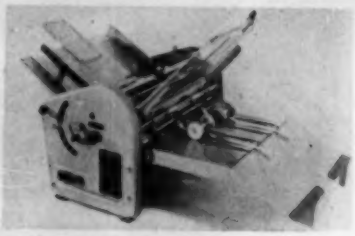
CHALLENGE ANNOUNCES NEW PORTABLE FOLDER

A new table model folding machine capable of handling sheets as large as 17 by 22 in., at speeds up to 9000 per hour has been announced by The Challenge Machinery Company.



Fold-Master Model FH-6

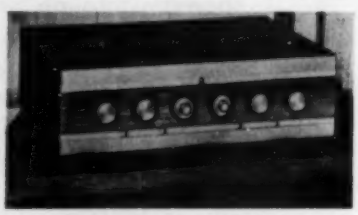
This new unit, called the Challenge Fold-Master Model FH-6, handles single or double parallel folds on sheets from 4 by 5 in. in size to 17 by 22 in. It also has two scoring wheels for right angle scoring. The new unit offers printers, duplicator operators, and offices a relatively inexpensive portable, table model folder — companion to the Challenge 9 by 18½-in. model introduced recently.

Folds as small as 1½ in. can be handled on this unit. Adjustment from single to double parallel folding is made by a simple flip of a lever.

(For further details encircle index code 0904)

NEW KNIGHT-KIT DELUXE 40-WATT STEREO HI-FI AMPLIFIER KIT

Allied Radio Corporation announces the release of the new Knight-Kit Deluxe 40-Watt Stereo Hi-Fi Amplifier Kit. An easy-to-assemble unit, it includes two fully integrated, built-in, preamps for accommodating any stereo or monophonic signal source, and it delivers a full 40 watts (80 watts peak), of stereo or monophonic



Knight-Kit Deluxe 40-Watt Stereo Hi-Fi Amplifier Kit

(Continued on page 30A)

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(For more information from advertisers, use the postcard on page 43A)

SHOP EQUIPMENT NEWS

(Continued from page 28A)

power. In addition, a specially designed center-channel output permits feeding full range output to a center speaker.

Frequency response of the amplifier is plus/minus 1 db, 15 to 35,000 cps at 10 watts; plus/minus 1 db, 10 to 50,000 cps at 5 watts. Distortion is less than 0.5 per cent at 20-watt output per channel. Hum and noise level measured at tuner input is 75 db below rated output; at magnetic phono input, 60 db below rated output.

Other features include: five pairs of jacks for stereo inputs, including tape head; individual hum balance controls for each channel; single-knob balance control; mode switch for selecting regular stereo, stereo reverse, and playing either the left or right channel through both outputs; dual-concentric, clutch-type tone controls; output jacks for stereo tape recording; and rumble and scratch filters.

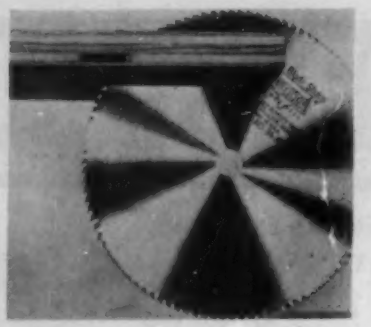
The amplifier kit is listed under Allied Stock No. 83 YX 774.

(For further details encircle index code 0905)

NEW DELTA PLYWOOD CUTTING BLADE

Rockwell Manufacturing Company's Delta Power Tool Division have introduced a new Delta plywood cutting blade, which eliminates chipping, shattering, or splintering in cutting plywood and other veneer faced wood.

The new low-cost blade has a 7-in. diameter with 200 small teeth around its edge and a ⅝-in. arbor hole. Made for 8-, 9-, and 10-in saws, the smaller diameter



New Delta Plywood Cutting Blade

increases cutting speed. The numerous small teeth, striking the wood in rapid succession, cut veneer fibers instead of chipping, shattering, or splintering them as other types of blades sometimes do. The new blade is particularly useful in cutting thin wood veneers.

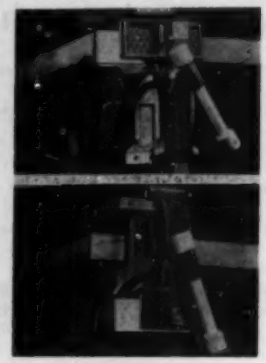
(For further details encircle index code 0906)

NEW COMBINATION METAL, WOOD VISE FOR SCHOOL SHOPS

The Wilton Tool Manufacturing Co., Inc., have introduced a new universal school shop vise, designed to serve woodworking and metalworking students as well as those in arts and crafts.

The new "Wilton Universal Turret Vise for General School Shops," will allow industrial arts instructors to teach more shop subjects in the same shop. This new tool is suitable for use in woodworking, metalworking, electrical, sheet metalworking, and craft courses.

Combining all the features of a woodworkers vise as well as a metalworking vise, the new Wilton product has a 3 by 7-in. woodworking jaw, a serrated steel jaw measuring 1 by 4 in., maximum opening of 5½ in., and a pipe capacity of ¼ to 4½ in. The Universal Vise is capable of 180 degree vertical rotation. Maple jaw faces and serrated steel jaw faces are furnished as standard equipment.



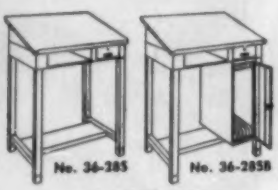
Wilton Universal Turret Vise

In addition, the Universal Turret Vise is equipped with the Wilton patented Rapid Titan Nut that permits quicker and easier opening and closing of the vise. The Rapid Titan Nut, with no moving parts to wear out, allows free sliding action when

PARENT METAL PRODUCTS

THIS CREST REPRESENTS QUALITY

IT APPEARS ON PARENT DRAWING TABLES



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Wet cut & dry cut.
4" x 4" — 5" x 5"
6¾" x 6¾" —
8½" x 8½"
10½" x 9"

Popular Model 3CH, 6¾" x 6¾"

The features of this wet cut machine that make it so popular in school shops include quick acting 45° swivel vise, foot lift to saw frame, pressure feed control (40-170 lbs.), automatic lift on reverse stroke, 2 speeds and automatic stop. Rugged construction with Oilite bearings throughout mean long life and low maintenance. Weight 475 lbs., floor space 16" x 47". Complete with single or 3 phase A.C. Motor and switch wired, $480.00 F.O.B. Factory, Eau Claire, Wisconsin.

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KELLER DIVISION

Sales Service Mfg. Co.

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(For more information from advertisers, use the postcard on page 43A)

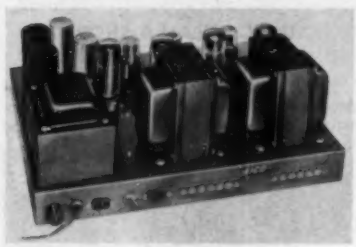
disengaged and positive screw action when tightened.

The vise also features offset woodworking jaws to permit vertical clamping of long work pieces, a socket for holding art metal anvils, dog in front jaw, removable metalworking jaws, and wood handle.

(For further details encircle index code 0907)

NEW STEREOPHONIC AMPLIFIER

Electronic Instrument Co., Inc., manufacturers of stereophonic and monophonic high fidelity kits and pre-wired components, announces the availability of a new high quality stereophonic amplifier, Model HF-87. The HF-87 has been designed and engineered for extremely low distortion (IM distortion is 1 per cent at 70 watts and harmonic distortion is less than 1 per cent from 20-20,000 cps within 1 db of 70 watts) and for the greatest possible stability (stability margin is the same as the feedback, 17 db).



Stereophonic Amplifier

The HF-87 employs a proved cathode-coupled phase inverter-driven circuit, with preceding direct-coupled voltage amplifier. The output stage uses ultralinear connected, self-biased, push-pull EL34s.

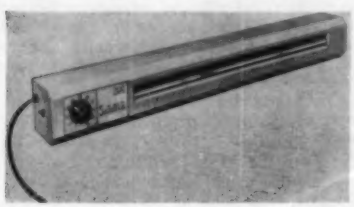
The new HF-87 can be used as a stereophonic dual 35-watt amplifier or the two amplifiers of the HF-87 can be operated in parallel to deliver 70 watts for monophonic use. A service selector switch on the chassis permits choice of service. Other convenience features include an input level control for each channel to permit adjustment of sensitivity, and a power on-off switch.

Write for further information on additional fine features of Model HF-87.

(For further details encircle index code 0908)

SATELLITE PRINTER

Eugene Dietzgen Company announces the availability of the compact, portable,



Satellite Printer

and easy to operate Satellite Printer. It produces top quality prints in minutes.

The Satellite Printer is compactly designed, 5 by 5 by 44 in., and can be hung

(Continued on next page)

NEW Hotpack HIGH TEMP. KILN

Temperature to 2350° F.

HEAVY DUTY

No. 7021

Fast come-up time 5 hrs. to 2300° F. 7" of insulation, including interlocked 2500° F. brick. Controls grouped in eye-level panel, recessed with special plexiglass cover to prevent unauthorized adjustment while in operation. Many other features.

SPECIFICATIONS

Model	Interior Size	Watts	Price F.O.B. Phila.
7021	10"x 9½"x 9"	2.8KW	$ 225.00
7024	19"x18½"x18"	220 volts	$1080.00

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SHOP EQUIPMENT NEWS

(Continued from previous page)

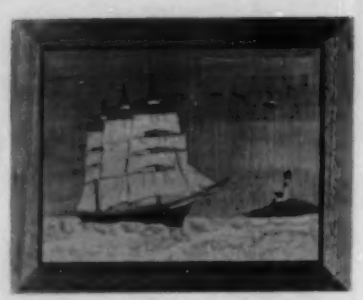
on the wall, placed on a shelf or table. One dial controls speed, permits exact reproductions from any translucent original. The printer handles prints up to 30 in. wide, any length.

Satellite Printer may be used with either the ammonia or semi-moist developing process.

(For further details encircle index code 0909)

PRE-CUT INLAID WOOD PICTURE KITS

Albert Constantine and Son, Inc., importers, manufacturers, and dealers in hardwood veneers and lumber, have produced a new idea in kits, from which wood inlaid pictures can be made by anyone, without experience or tools. Assembled like a jigsaw puzzle, from over 65 different kinds of rare woods from all over the world, these kits can make heirloom treasures when completed. Each piece of wood has been cut to exact size and shape by skilled marquetry artisans, and no cutting or shaping of any kind is required. They are only to be assembled and glued to the panel provided.



Pre-Cut Wood Inlay Picture

These large kits are listed and illustrated, for the first time, in Constantine's new 1960 catalog. Six diversified and interesting subjects were chosen in making up these big Pre-Cut kits, the largest of which when completed measures 13¾ by 22 in., and the smallest 12⅝ by 16 in. The kits contain all necessary woods, borders, panels and patterns, with complete instruction folder.

Further information available.

(For further details encircle index code 0910)

NEW BOOKLET

HELPS YOU PLAN AND IMPROVE YOUR SCHOOL PRINT SHOP

Here is a helpful aid to school supervisors, shop instructors, and others interested in planning new graphic arts departments or expanding present facilities.

This booklet provides a useful guide to the selection of the most practical paper cutting, proofing, paper drilling or punching, composition and lock-up equipment, and supplies for school print shop needs. Mail coupon for your free copy of this booklet.

SCH-101

Challenge

THE CHALLENGE MACHINERY COMPANY
Grand Haven, Michigan IAVE-11

Please send me a copy of the new Challenge Booklet entitled "Planning Your School Shop."

Name_____ Position_____

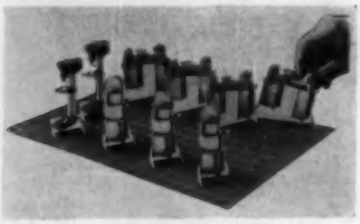
School_____

Address_____

City_____ State_____

DURO "PLAN-A-SHOP" CUT-OUT KIT

The Duro Metal Products Company have developed a new planning kit to provide a sound, practical way to insure correctness in shop planning.



Duro Cut-Out Kit for Planning a Shop

The "Plan-a-Shop" Cut-Out Kit consists of a colorful brochure outlining the basic principles of shop planning, a large blueprint floor plan and dimensional power tool cutouts which are exact, scaled down models of the essential power tools every school shop can use.

The base of each stand-up cutout gives an accurate "top view" for gauging the correct width and depth on a ¼-in. to 1-ft. scale. Not a toy, but a practical planning aid, it enables anyone to get an immediate visual perspective on an entire shop layout, showing the exact size relationship between models, the utility value of combining "companion" pieces, the space required between units for maximum operator safety and use. Tool cutouts, printed on heavyweight cardboard, can be used over and over again forming an indefinite number of practical combinations to suit a particular floor area.

It is available to school administrators and educators for a postage and handling charge of 25 cents. Additional cutouts are available free upon request.

(For further details encircle index code 0911)

BORDEN'S HYDOCURE MASONRY SEALER

Borden Chemical Company's new masonry sealer compound Hydrocure, designed to lock out water pressure up to 1½ tons

(Continued on page 34A)

ON THE SPOT REPORT

New York, N. Y., Students learn on Universal Desk-Topper Drafting Machines in the New York Trade School drafting classes. George E. McLaughlin, Supt.; Oscar Rath (standing at middle), Dept. Head; Joseph Baker (front left), Instructor. Installed by Eugene Dietzgen Co., New York City.

DRAFTING DEPARTMENTS MEET URGENT NEED FOR DRAFTING MACHINE INSTRUCTION

Recognizing the importance of developing proper drafting techniques — so urgently needed in industry — department heads and instructors are specifying Universal Desk-Topper drafting machines for classroom use. Students acquire essential drafting machine skills while learning. Specially designed and budget priced for school use, Desk-Toppers are precision engineered to full professional standards. Write for listing of installations throughout the country.

New York Trade School stores Desk-Topper drafting machines safely under lock and key.

FREE TECHNICAL TEXT

presents suggested course of instruction!

Send for your free copy. Chapters 3 and 4 constitute a suggested course of instruction in drafting machine technique and operation. (Please include school name and address.)

UNIVERSAL DRAFTING MACHINE CORP. 7960 Lorain Avenue • Cleveland 2, Ohio

Makers of UNIVERSAL BOARDMASTER and UNIVERSAL TRACMASTER... the Drafting Machines Preferred by Industry

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MASTER TABLE

Two Low Priced Drafting Tables

Drawing top of Master table pivots at front edge — Knee room is constant. Table adjusts from sitting to standing height. Top solid basswood having metal edges.

Gem is low-priced drafting table, hardwood base, solid basswood top. Shipped K. D. in natural state. Described in folders S-8 and S-17. Send for your copies today.

Symbol of MAYLINE Superiority

GEM PEDESTAL TABLE

MAYLINE COMPANY

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Sheboygan, Wisconsin

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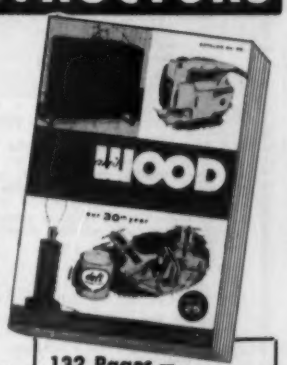
ALL NEW, COMPLETE CATALOG OF WOOD & WOODWORKING EQUIPMENT *FREE* TO INSTRUCTORS

New 1960 Edition . . .

Finest Domestic and Rare Woods... Moulding... Tools . . . Imported Ceramic Tile ALL AT LOWEST PRICES

INSTRUCTORS! Just mail coupon for your FREE COPY (25c to students, refundable with first order) of our giant new 1960 woodworking catalog. We are America's largest source of fine domestic and rare imported woods for projects. Also bandings, veneers, inlays . . . all shown in full color. Includes over 250 scroll patterns. See newest tools, equipment and hard-to-find cabinet hardware. Rush your request today!



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2727 Mary St., Dept. F-11, Chicago 8, Ill.

CRAFTSMAN WOOD SERVICE COMPANY
2729 Mary St., Dept. F-11, Chicago 8, Ill.

INSTRUCTORS: Send new WOODWORKER'S HANDBOOK — FREE (enclose 25c if student, refundable with your first order).

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132 Pages —

- . . . many in full color . . . newest project ideas
- Embossed mouldings, carved ornaments, matched plywoods and veneers
- Complete lines of archery and upholstering supplies
- New! Blanks for baseball bats, snow skis, complete water ski kit
- New! Clock kits, Swiss music movements, Hi-Fi Cabinet woods.
- "Deft" all purpose finish
- Same day shipment; guaranteed satisfaction

WOOD FINISHING TIPS

1. The complete interior WOOD FINISH in one can

Nothing else to use from raw wood to bar-top finish. A non-darkening clear, semi-gloss finish for all interior wood projects. Fast dry, three coats can be applied the same day.

2. Natural wood beauty

Today, there is a wealth of woods and plywoods to select from in the making of any project. Select the wood for its natural charm, then protect and dramatize its beauty with clear Deft.

3. Deft over stain

If staining is called for, apply one of the many stains and wipe off to the tone wanted. Then use the Deft aerosol spray can to set the stain. The Deft spray coat will dry within minutes. Additional coats of Deft may then be applied by either brush or spray.

4. Brushes last for years

Do not clean Deft finishing brushes. Simply close them in a partially filled gallon can of Deft, until the next time. Or keep them in an air-tight Saran-type wrap. It is the lacquer thinner used in cleaning, not the finish material, that deteriorate the brushes.

5. Deft protects brass

Spray brass hardware for protection against tarnish and corrosion. May also be used as a protective coating on tools of all kinds.

6. Free Wall Chart

Deft 6-step simplified wood finishing wall chart available for use in industrial arts classes. Over 6,000 requests have already been filled for these charts. Write Dept. I.A.

Desmond Bros.
Box 2216, Torrance, Calif.

SHOP EQUIPMENT NEWS

(Continued from page 32A)

per square foot in wet basements and swimming pool applications, will get national distribution this year, the company announced.

Borden's Hydrocure Masonry Sealer

The two-part sealer is designed for most all porous masonry surfaces such as cement, cinder block, cement stucco, stone and brick. It is available in three basic sizes. The medium size unit shown comes in a reusable home handyman pail.

Released recently to ten North-eastern states, it is now being made available to 14 additional Midwest states.

(For further details encircle index code 0912)

RESP-R-AID — A NEW ALL-FILTER DUST MASK

Watchemoket Optical Company have made available their new lightweight, urethane filter respirator. Called Resp-R-Aid, this new mask is molded in one piece of plastic foam and has a functional filtering

New All-Filter Dust Mask

area more than double that of most other masks. The increased filtering area greatly reduces inhalation resistance to make breathing considerably easier, and the special urethane construction filters out even minute particles.

Because it is all plastic, Resp-R-Aid is extremely light — weighs hardly more than an ounce — and its soft rolled edges assure

(Continued on page 36A)

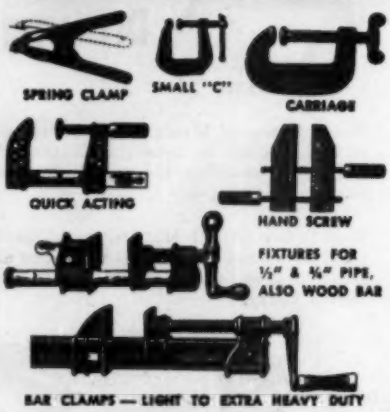
the easy way to plan a shop!

Send for Valuable Kit Today!

Duro kit of machine tool cut-outs offers the first practical way to organize a power tool workshop. Includes colorful brochure explaining principles of shop planning, large blue print floor plan, and stand up cut-outs of basic power tools. You can actually "see" what your shop will look like, quickly determine space between units for safety, learn how companion pieces work side-by-side, discover physical limitations of your floor area at a glance. It's a valuable help to any school planning a new shop or revising an old one. Send 25¢ to cover cost of handling and postage to:

DURO METAL PRODUCTS CO.
2674 N. Kildare Ave., Chicago 39, Ill.

HARGRAVE
The Complete Line of Tested TOOLS



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FOR SAFETY AND LONGER LIFE

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CRAFTKILNS beautifully finished in a green Hammer-tone, heat-resistant paint. They are available in five types to suit every ceramic need. Front Loaders, in both STANDARD and HI-FIRE models. Top loaders, in both STANDARD and HI-FIRE models, and METAL ENAMELING KILNS. Stewart will also build kilns to your specifications. Please write for complete information on custom kiln construction.

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- Guaranteed Elements and Switches
- U.L. Approved Components
- Pilot Light on Models
- Nichrome or Kanthal Elements
- Manufactured to Exacting Specifications
- Economy of Operation
- Low Initial Cost

Prices range from $12.95 up.

Model No. 84. Complete with built-in pyrometer, temperature holding control and counter-balanced door. The best value in enameling kilns today. This is truly a professional enameling kiln which is completely controlled to give any desired results. **Complete as shown — $74.50** including packing charges.

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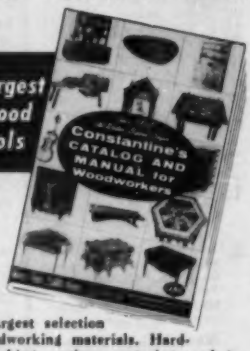

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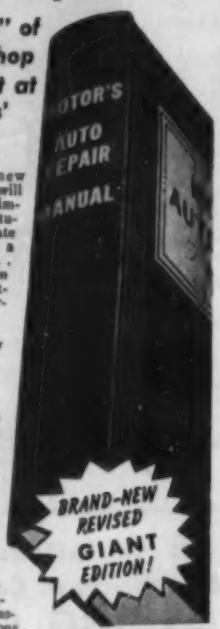
Step-by-Step Picture Guide to Car Service and Repair

Puts the "Meat" of 176 Official Shop Manuals Right at Your Students' Fingertips



MOTOR'S brand-new Auto Repair manual will make your job a lot simpler. It shows your students exactly how to locate troubles, where to start a job, what tools to use . . . how to do everything from a simple brake adjustment to a complete overhaul.

Most Popular Car-Repair Book in the World — Three Million Copies Sold

This giant book shows factory-approved procedures for repairing and servicing 1,967 models —every popular make, 1952 through 1959. 1,120 giant crystal-clear pages, 2,850 can't-go-wrong pictures, 195 quick-check charts, 30,000 essential repair specifications, 225,000 service-repair facts. Step-by-step guidance on: Engines, Automatic Transmissions, Air Suspensions, Ignitions, Fuel Pumps, Steering Gears, Brakes, Generators, Distributors, Power Brakes & Steering, etc., etc. PLUS TROUBLE SHOOTING SECTION showing how to spot 2,300 car troubles fast! Used by U.S. Armed Forces, mechanics, schools.

Double Offer for Teachers Only

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Motor's Truck Repair Manual. Details 3,860 truck models since 1952, 300,000 service, repair facts, 2,000 illus. Everything students need to make truck repair simple. Over 800 giant pages.

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Name.....
School.....
Street.....
City.....Zone....State.....

SHOP EQUIPMENT NEWS

(Continued from page 34A)

a comfortable fit, snug to the contours of any face.

Resp-R-Aid consists of a one-piece urethane filter; a plastic chassis which houses an inhale valve and two exhale valves; and an adjustable neckband which is fastened to a plastic retaining band. The urethane filter can be washed repeatedly and re-used; it is nonallergic, does not absorb odors and will not mildew or deteriorate; and is available in attractive colors.

For more complete information, write for Watchemoket's new brochure, "An Entirely New Approach to the Dust Filtering Problem."

(For further details encircle index code 0913)

HYDRAULIC, HEAVY DUTY BAND SAW

The Machine Tool Division of Kalamazoo Tank & Silo Company announces the addition of a completely hydraulic, heavy duty band saw to its line of horizontal band saw machines.

The new Model 14A, called the "Big K," offers cutting capacity and ability in excess of any cutoff method, at far less tool cost per square inch of cutting. The machine includes a number of completely new developments.

Hydraulic, Heavy Duty Band Saw

These special features: (1) hydraulically driven blade; (2) clockwise blade rotation to reduce tooth shock when entering the workpiece; (3) positive cutting pressure at all times; (4) convenient 36-in. machine height to reduce operator fatigue; (5) large 14 by 24-in. rectangular capacity. In addition, it includes: dual movable vise jaws; adjustable blade tension, vise jaws and cutting pressure; grooved blade wheels for different blade widths; double opposed rotary blade cleaning brushes; a center cutting position; and a Timkenized bearing pivot bar.

The "Big K" is said to be the culmination of machine tooling ideas developed over a period of 20 years.

Facilities for test runs of material on the "Big K" are available to anyone at the firm's plant.

(For further details encircle index code 0914)

THE POWERMATIC 12-IN. TILTING ARBOR SAW

Powermatic Machine Company announces an improvement in their Model 70-12-in. Tilting Arbor Saw.

ENCYCLOPAEDIA OF HAND-WEAVING

by Stanislaw W. Zielinski

Profusely illustrated and alphabetically arranged, this brand new book is not only an authoritative reference work on hand-weaving terminology, but also a treasury of general information about this fascinating craft. Included are complete facts on materials, tools, patterns, and fabrics.

ENCYCLOPAEDIA OF HAND-WEAVING is cross-referenced and classified. It is the only comprehensive guide in English to the large and growing literature of the craft.

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MINNESOTA WOODWORKERS SUPPLY CO.

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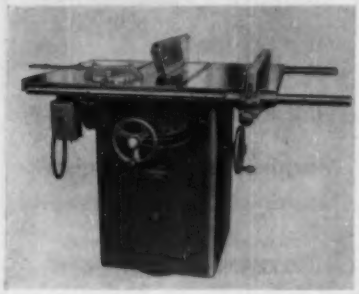
MINNEAPOLIS 5 MINNESOTA

All are now equipped with tubular guide bars, front and rear. This change necessitated development of an entirely new rip fence, incorporating features most desired by all consumers. Alignment of the fence



Powermatic 12-in. Tilting Arbor Saw

with the table is accomplished by means of an adjusting screw in each side of the fence. This feature insures accurate ripping of all types of stock.

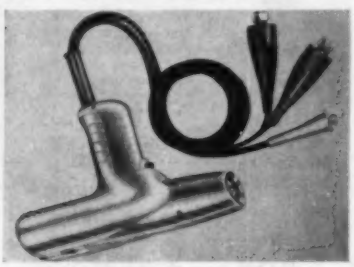
The front bar has an accurate vernier scale adjustment with lines and figures painted red for easy reading. The fence-locking mechanism with front and rear control handles is conveniently located at the front of the fence.

The new Saw is Model Number 71. Full details are outlined in Bulletin No. 63.

(For further details encircle index code 0915)

NEW MT-215 TIMING LIGHT

Snap-on Tools Corporation announces the New Timing Light, designed entirely from the professional mechanic's viewpoint. Long service life, dependability, performance, and ease of use were prime factors in the development of this new unit.



New MT-215 Timing Light

Much greater, more concentrated light is said to be provided, by means of a new, highly efficient electrical circuit, and light is equally bright when used on either 6-volt or 12-volt systems. High impact plastic case withstands hard usage and will not break if dropped. It is said that the glossy red finish will not bleach from sunlight, and will not be harmed by usual garage solvents.

The specially shaped case has a pistol grip handle, and features a push-button switch. The switch has ample overtravel to permit comfortable operation by virtually any hand size. Net weight of the entire unit is 2¾ lb.

(For further details encircle index code 0916)

NEW SPEED FORMING TOOL

Stanley Tools, division of The Stanley Works, have introduced the newest member of the "Surform" family of speed forming tools. It is the convex plane-type model (No. 397) with new fine-cut blade designed to shape, shave, and smooth curved and concave surfaces, to file and form recessed areas such as metal castings, patterns, and valances in the school shop. Two knobs make it a draw-cut or push-cut tool with equal ease.

Cutting is done with the hardened and tempered Sheffield steel blade and its 500 individual sharpened cutting edges. The blade will not clog because the chips pass through the blade. Each edge has its own

(Continued on next page)

Model No. 397 New Speed Forming Tool

THINKING OF A NEW OR EXPANDED ELECTRIC SHOP?
Flexlab electric supply and distribution equipment
FOR HIGH SCHOOL ELECTRIC SHOPS
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STANDARD
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(For more information from advertisers, use the postcard on page 43A)

Teach Electronics the Modern Way — Use the New IASCO 3 Transistor Radio Kit

This new speaker kit is designed as an educational electronic project. May be used at 8th grade level.

Kit consists of a good quality 4 inch speaker, 3 transistors, 1 nine volt battery and battery holder, 6 resistors, 1 variable condenser, 4 fixed condensers, 1 output transformer, 2 terminal lug strips, ferrite loop stick, plastic case with carrying handle, face plate with template and rear cover for case, connecting wire, tuning knob and selector knob, volume control, switch, 2 diodes, 1 RF choke and complete instruction sheet. List price on this kit is $22.50.

Special introductory offer only $9.95

Kit is complete, including solder, nothing else to buy.

Write for complete catalog on projects and material for the shop.

Industrial Arts Supply Co.

Box 5340 Minneapolis 8, Minnesota

SHOP EQUIPMENT NEWS

(Continued from previous page)

throat which carries shavings away from the work.

New convex plane-type "Surform" has rugged die-cast body with two hardwood handles. Quickly replaceable *fine-cut* blade is interchangeable with "Surform" plane and file type models as are the regular cut blades.

Further information available upon request.

(For further details encircle index code 0917)

NEW TOLERTON CABINET BASE WORKBENCH

Room arrangement possibilities are unlimited with new Cabinet Base Workbench Model TCDB-3072-W, designed and built by The Tolerton Company.

New Tolerton Cabinet Base Workbench

Any size and thickness top can be used to meet special requirements. Risers 4, 5, and 6 in., high can be used for desired height.

Base Cabinet Model TBC-1 is equipped with adjustable shelf on 2-in. centers. Total approximate weight is 43 lb. A 4-drawer cabinet — Model TDC-1 — has individual drawer size of 14 in. wide by 21 in. deep by 5 in. high. Weight 100 lb.

Further information available from The Tolerton Company.

(For further details encircle index code 0918)

L-W CHUCK DIVIDING HEAD

Direct indexing heads are now being made available for all models of L-W Chuck dividing heads. The new models with direct indexing permit changing from conventional indexing to direct indexing in less than a minute. Worm and wheel adjustment eliminates back lash. A 24-slotted plate is standard equipment with direct

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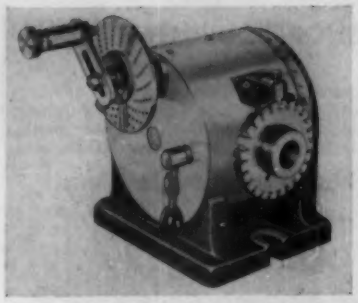

L-W Chuck Dividing Head

indexing models. Machine blanks can also be furnished.

Literature on this new equipment will be sent to anyone addressing a request to L-W Chuck Company.

(For further details encircle index code 0919)

MISSILE-SHAPED CARTRIDGE FOR HIGGINS INK

Higgins American India Ink is now available to draftsmen and artists in a convenient new missile-shaped cartridge.

Higgins' New Missile Shaped Cartridge

Made of sturdy plastic, the compact rigid cartridge slips easily into pocket, purse, or drafting kit. The new cartridge stands upright or may be placed on table, shelf, or desk without rolling off inclined surfaces.

The drip-free tip feeds just the right amount of Higgins Ink into pens and drawing instruments without mess or waste. Perfect for drafting room and studio use. Ideal for outdoor sketching.

Information on prices, etc., available.

(For further details encircle index code 0920)

STARRETT'S VERNIER HEIGHT GAUGE

The L. S. Starrett Company have built a 72-in. Vernier Height Gauge for the Lockheed Aircraft Corporation, Missile and Space Div., of Sunnyvale, Calif. This six-foot precision gauge is used in Lockheed's inspection department to check various components for missile work as illustrated.

The L. S. Starrett Company builds these oversize Vernier Height Gauges on special order, including 60- and 72-in. sizes. Standard sizes are also available covering 12-, 18-, 24-, 36-, and 48-in. ranges.

All of these new Starrett No. 254 Master Vernier Height Gauges have a long, flush fitting Vernier with open face design and 50 widely spaced graduations; fine adjust-

(Continued on next page)

NEW LEARNING UNIT

STUDENTS BUILD

WATER SKIS

from quality S-4-S (bent only) stock— finest grade fittings supplied

Students start with rough pre-bent blanks shown here

Now any student can own the finest water skis and, at the same time, increase his woodworking skills. Ski blanks and fittings are supplied by one of the world's largest producers of quality water skis. Scale drawings and instruction sheet included.

SPECIFICATIONS:
Stock ⅝" thick x 7" wide x 6' long. Permanently bent at one end with hardwood spline reinforcing toe of ski. Choice of Marine Plywood with Crezon surface, Sitka Spruce, Philippine Mahogany, Solid White Ash. BINDINGS: White Neoprene rubber. Aluminum parts, single adjustment, self-locking heel plate.

SKI CRAFT CUSTOM WATER SKI FINISHES

This unit consists of one pint of Ski Craft Custom Sealer-Primer plus one pint of Clear Finish, or, for Crezon skis, one pint of Yellow Finish. These finishes are especially compounded to withstand the hard usage and moisture inherent in water skiing. Complete finishing instructions included.

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SHOP EQUIPMENT NEWS

(Continued from previous page)

ment knob on base and quick adjusting slide release; hardened, stabilized master bar; Starrett Satin Chrome Finish, and

A Starrett 72-Inch Master Vernier Height Gauge

many other features making the gauges extremely accurate and useful for all inspection and gauging operations.

(For further details encircle index code 0921)

MILWAUKEE TOOL & EQUIPMENT ANNOUNCES EXPANDED LINE

Milwaukee Tool & Equipment Company, well known in the manufacture of bench vises and farm equipment, have announced the expansion of their line to include malleable iron pipe tools. The expanded line includes four new malleable iron threaders, two new malleable iron "Saunders-Type" cutters and a malleable iron portable pipe stand.

Tool-steel threading dies are heat-treated after machining, for easiest starts, fast and clean cutting. The four threaders handle pipe ranging in diameter from ⅛ in., up to 2 in.

The two cutters are built of tough, malleable iron castings, accurately machined. Steel screws are cold-rolled, smooth-working and razor-edge wheel and hardened rollers and pins provide accurate cutting. The two cutters cut ⅛-in. to 2-in. diameter pipe.

Malleable Iron Pipe Tools

Capable of accommodating the No. 851 and 852 Milwaukee Pipe Vises, the Portable Pipe Stand consists of a tough, malleable iron table supported by three 1⅝ in., o.d. by 41-in. legs, forming a 46 by 46 by 46-in. tripod, with a table height of 36 in. Legs fold for storage.

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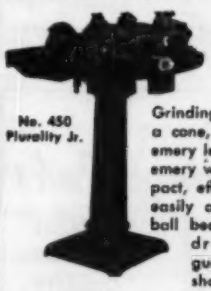

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Grinding can be done on a cone, coarse or fine or emery leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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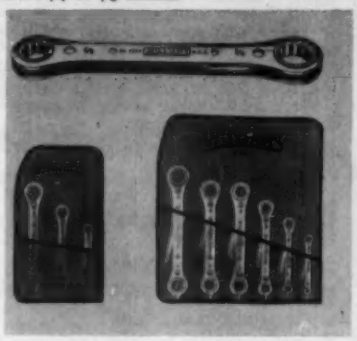
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

Each of the new pipe tools is finished in hammered silver and packed one to a carton for shipping.

(For further details encircle index code 0922)

WILLIAMS ADDS RATCHETING BOX WRENCHES TO LINE

J. H. Williams & Company have added to their line six sizes of Ratcheting Box Superrenches with 6- and 12-point openings from ¼ to ⅞ inches.



Ratcheting Box Superrenches

Nuts and bolts can be turned faster and easier with this new style of wrench. Openings are accurately broached to assure proper fit.

All critical parts, made of selected alloy steel, are heat-treated for long lasting service and safety. Wrenches are chrome-plated over nickel.

In addition to being sold individually, Williams offers two sets in plastic leatherette rolls.

(For further details encircle index code 0923)

PROTECTIVE SAFETY SPECS

General Scientific Equipment Company have marketed a new, lightweight design of safety glasses to protect workers from

Protective Safety Specs

(Continued on next page)

BUILD YOUR OWN! FROM BOATS TO TIE-RACKS

Knockdown units made of genuine Tennessee aromatic red cedar and other woods

New 4-color catalogue offers dozens of challenging "do-it-yourself" items

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GILES & KENDALL CO.
Box "E" Huntsville, Alabama

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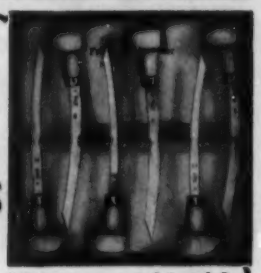

This set of 6 gravers, consists of 2 round No. 3 & No. 10, 2 flat No. 2 & No. 10, Lozenge No. 3 knife. Tools are slightly bent for clearance of hand to make it easier to work. Top Quality Steel. Blades will keep sharp, keen edge and give a lifetime of service.

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DONJER PRODUCTS COMPANY

SHOP EQUIPMENT NEWS

(Continued from previous page)

the danger to sight of flying objects. The new glasses combine attractive styling, featherweight protection coupled with low cost.

Some of the semi-hazardous operations where Safety Specs are recommended include: spot welding, buffing, woodworking, handtool operations, inspection, protection of prescription glasses, home workbench chores.

Half-the-weight Safety Specs are available with clear or green lenses.

Write for complete information or trial order to the manufacturer.

(For further details encircle index code 0924)

Descriptive Material . . .

TWO NEW CATALOGS OF IMMERMAN & SONS COMPANY

Publication of the 1959–60 edition of Enamel-on-Copper has been announced by Immerman & Sons Company. This 64-page catalog includes a complete listing of tools, supplies and equipment, and a wide variety of enameling projects and Immerman's famous detailed and illustrated instructions. The catalog also introduces a new creative art and projects, Glass-Firing. Four full pages are devoted to a new section on porcelain jewelry.

Another catalog, the new 1959–60 Crafts and Hobbies catalog, contains 32 pages, listing tools, supplies, and new ideas for mosaics, seed art, marquetry, metal tooling and etching, plastic plants and flowers, along with step-by-steps, detailed and illustrated instructions.

Crafts and Hobbies is designed and written to assist and serve every type of arts and crafts program.

Each of these catalogs is available free.

(For further details encircle index code 0925)

K&E CATALOG

Keuffel & Esser Company have released a specially prepared catalog which lists engineering equipment and supplies for student engineers.

"Your K&E College Buying Guide" is a 28-page, illustrated booklet which presents information and order numbers on slide rules, drawing instruments, drafting supplies, drawing and tracing papers, graph sheets, and lettering sets.

The booklet is designed to provide freshmen students with facts on their current and future engineering needs.

(For further details encircle index code 0926)

SAMS ANNOUNCES NEW PUBLICATIONS

Electronics Reference Data, Vol. 2. Cat. No. ERA-2, 128 pp., 8½ by 11 in., illus., $2.50.

Seven sections in Electronics Reference Data cover such general topics as: antennas and transmission lines, UHF television, circuit design, audio, radar, meters and measurements, and specialized application and development.

These selected articles from the *Aerovox Research Worker* are the most helpful and popular. A complete index pinpoints the exact subject matter quickly.

101 Ways to Use Your Signal Generator, by Robert G. Middleton. Cat. No. TEM-4, 128 pp., 5½ by 8½ in., illus., $2.

This is a new addition to the "101 Ways" Library. It is a practical working guidebook for the service technician or for anyone who uses a signal generator. All of the common and many of the uncommon uses of signal generators are covered. A total of fifty-one special notes supplement the 101 uses described. The equipment needed, the connections required, the procedure, and the evaluation of results are given for each one. All 101 Ways are indexed for easy reference.

Video Speed Servicing, Vol. 3, by Samuel L. Marshall. Cat. No. VSM-3, 160 pp., 8½ by 11 in., $2.95.

This new volume features 456 specific troubleshooting hints that will locate and cure the harder-to-find faults in many popular TV receivers. An explanatory diagram or schematic accompanies each hint, showing where the trouble is and how to correct it.

The hints are arranged in alphabetical order by brand name of receiver and cover 87 chassis of late-model popular chassis. Volume 2 of this series with similar coverage on other chassis is also available.

These books are sold through electronic parts distributors throughout the country, or available from Howard W. Sams & Co., Inc.

(For further details encircle index code 0927)

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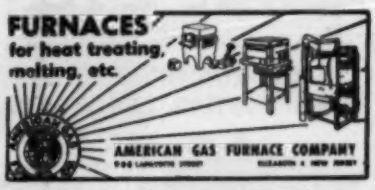

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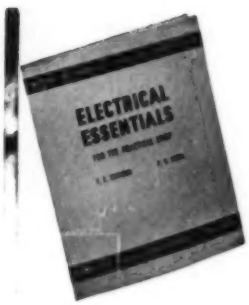

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